"The real explanation of the striking difference in birth and death rates is that the Japanese and the Chinese on the island form two separate groups, the living conditions and customs of which are completely different. But the figures reveal more than this. The birth rate of the Japanese in Taiwan is only slightly below that of the Japanese in Japan Proper, while the death rate of the Japanese in Japan is 17.0 (1937) and in Taiwan only 9.6 To some degree this may be explained by the fact that there are a smaller number of aged Japanese on the island, but this alone is not sufficient. It is well known that in the same population different social classes have different death rates. The social composition of the Japanese [31] on the island is such that they are better off than the Japanese in Japan, to say nothing of the Chinese in Taiwan, whose death rate is more than double that of the Japanese. The Japanese on the island live under better sanitary conditions, are better fed, have better medical treatment and more leisure than the masses of the Chinese. This does not mean, of course, that the death rate of the Chinese is stable: it is falling, and this fall, typical of all colonial countries similarly situated, is probably due to improved methods of combatting epidemic diseases.

4:Grajdanzev--30-31 S-4 (no date) 1942 Formosans-2
116, 162, 165, 171, 563

Death Rates In Some Tropical Colonies
(per thousand)

	1911-13	1921-25	1926-30	1931-35	1937
Taiwan	...	24.0	22.0	20.6	19.3
Palestine	...	23.7	24.3	21.0	15.0 (1938)
Philippines	19.1	18.9	19.7	18.5	18.8
Ceylon	31.8	27.8	25.1	24.7	21.7
Straits Settlements	40.0	28.9	30.7	24.7	21.3

As regards mortality, Taiwan is in about the same position as other colonies, a fact which suggests that living conditions are comparable to those in any other colony named above."

B. Deaths

165 While the birth rates for the last few decades remained scarcely changed, the death rates were reduced to less than half during the same period (see Table 8). The present death rate of 9.5 compares favorably with the rates of the United States (9.6) and Canada (9.0) for 1950.[21] However, it is possible that the registration system may have presented a lower death rate in Formosa because some deaths went unrecorded as a result of administrative laxity, or because relatives of the deceased hoped to continue to receive the additional rice ration.

In cities where adequate medical facilities are available, the death rates are definitely lower.[22] A great number of infants die, but children who attain the age of 10-14 may be expected to live to be adults. After the age of fifty, the number of deaths increases rapidly.

21. United Nations, op. cit., p. 168-69.

22. Norman Wycoff, "An Outline of Demographic Conditions and Prospects on Taiwan," Chinese-American Economic Cooperation, Vol. I, No. 5, May 1952, p. 54.

45: Stanford U. S-4,5 1956 AD1 Formosa AD1

(faces p. 86.)

Table 9. Death Rates by Age and Sex */

	1950	1951	1952
•165 Under 1			
Male	39.9	42.7	37.7
Female	36.5	38.0	36.6
1-4			
Male	23.0	23.4	16.8
Female	25.0	26.5	19.7
5-9			
Male	3.3	3.4	3.1
Female	3.6	3.3	3.4
10-14			
Male	2.3	2.2	1.8
Female	2.0	1.8	1.6
15-19			
Male	2.2	2.2	1.8
Female	2.2	2.0	1.8
20-24			
Male	3.4	3.5	3.0
Female	3.5	3.3	2.8
25-29			
Male	4.2	4.7	3.9
Female	4.2	4.1	3.2
30-34			
Male	5.4	5.4	4.5
Female	5.1	5.3	4.3
35-39			
Male	6.2	6.8	5.7
Female	6.3	6.2	5.3
40-44			
Male	10.3	9.6	8.0
Female	8.8	8.7	6.8
45-49			
Male	13.9	13.5	10.9
Female	10.6	10.2	8.3
50-54			
Male	20.3	18.7	15.6
Female	15.7	13.0	10.5
55-59			
Male	30.5	26.5	23.6
Female	21.1	18.2	14.7
60-64			
Male	41.1	41.4	35.7
Female	30.5	28.0	25.2
65-69			
Male	58.2	57.6	52.8
Female	41.4	38.4	34.1
70 and over			
Male	126.4	131.5	117.9
Female	93.9	101.1	90.5
Average, All Ages			
Male	11.5	11.7	9.9
Female	11.2	11.4	9.8

* United Nations Statistical Office, Demographic Yearbook, 1953, New York, pp. 184-186.

[Facing p. 86]

697 an infirmary. Efforts have been successful in preventing epidemics and infectious diseases among the prisoners.

697 The number of deaths[8] in prisons and
165 detention houses has been progressively reduced during the past five years although the number of inmates has remained more or less constant. The following table attests to the improved conditions in Formosan prisons. */

DEATH RATE IN FORMOSAN PRISONS

At End of Year	Number of Inmates In Prisons	Number of Inmates In Detention Homes	Total No. of Deaths During the Year
1949	2,909	1,691	70
1950	2,619	1,209	23
1951	3,667	2,043	19
1952	2,906	1,954	13
1953	3,021	2,346	8
1954	—	—	—

*/ Yearbook of the Republic of China, 1953, 1954.

II. THE POLICE SYSTEM

625 The Ministry of Interior of the Executive
635 Yuan exercises general supervision over the

8. In 1946 there were 863 deaths caused by epidemics in Formosan prisons. The number of deaths in prison in 1947 was 222 and in 1948, 156.

this growth was due to the natural increase of the Chinese people. Density of settlement increased to 376 per square mile of total land area in 1935, and to 424 in 1940. This was a high density in a country where 70 per cent of all gainfully occupied men were in agriculture and cultivated land was limited to the river valleys of the northern tip and the fertile areas facing China. Industry was limited largely to the processing and transportation of agricultural products until the war preparations of the Japanese induced rapid industrialization and urbanization in the middle and the late thirties.

In this economic development, Japan's main interest lay in agricultural commodities which enabled her to be less dependent on sources outside of the Empire. The Japanese occupied the major administrative, technical and managerial positions while the Chinese comprised the farmers and the unskilled laborers. The latter were maintained in relative isolation from the outside world with minimum possibilities for economic or cultural advancement. However, an increasing proportion of the children of the Island received elementary education and some even received a secondary education. A select few attended the Imperial University in Taiwan and went on to study in Japan. This cultural leaven was Japanese-oriented to a degree far beyond linguistic adaptation. In fact, the Japanization that had been in process of slow evolution since the initial conquest became a firm policy of forced cultural assimilation by the late thirties.

Here was a classical experiment in the potentiality of the Chinese peasant to reproduce his numbers under favorable conditions. Famines were eliminated and food available for subsistence increased in amount. Epidemics were controlled and the effects of endemic diseases were mitigated. All forces conspired to preserve and to sustain life in so far as possible with known technologies and at minimum cost. The same economic and political ideology insured the continuation of high birth rates. The familial values which had insured survival throughout the millenia in the rice lands of the Mainland were preserved in the isolated peasant villages of Taiwan.

THE DEATH RATE

The demographic paradox of colonialism appeared early in Taiwan. A combination of forces produced a decline in the death rate without either a concomitant or a delayed decline in the birth rate. Recorded death rates

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563 declined consistently from 33 per 1,000 total population in 1906 to 1909, to 20 in 1930 to 1937, with temporary setbacks only during World War I.

Life tables for the Japanese and the Chinese as of 1926 to 1930 place in sharp focus the low economic and health position of the native peoples as contrasted to the alien elite. The expectation of life at birth for males was 38.8 for the Chinese and 48.5 for the Japanese. The excess deaths of the Chinese were concentrated among children. Deaths during the first year of life amounted to 174 for each 1,000 boy babies among the Chinese and only 85 for the Japanese. Only 73 per cent of the Chinese boy babies lived to reach age 5.

The decline in the mortality of the Taiwanese under Japanese domination was appreciable but it did not approach the attainment of the standards deemed minimal in the West. At the end of the Japanese period the expectation of life at birth was perhaps 10 years greater than it was for the people of China or of India when there were no major epidemics or famines. The allocation of a larger portion of the production of the Island to the health, educational and cultural needs of the people could have produced sharp declines in the death rate and hence an even more rapid rate of population increase. An altered distribution of income within the existing technological

Taiwanese Children

matrix could easily have reduced death rates to 12 or 15 per 1,000 total population and, if birth rates had remained at 45, shot the rate of natural increase from 2.5 per cent per year to 3.0 per cent or more. 165 563

THE BIRTH RATE

Neither the extension of cultivation, the increase of yields nor the health and medical activities in Taiwan produced any major changes in the familial patterns of the peasants. The recorded birth rate of the Chinese remained above 40. There were some slight evidences of a lower birth rate in the more prosperous and urbanized provinces, but the social and occupational groups that might have adopted the modern individual and familial values, rather than the traditional Eastern values, were few in numbers. 163

The growth implicit in the maintenance of fertility at the level that existed in Taiwan during the last decade of Empire was indeed rapid. The gross reproduction rate for the entire population was over 3.2 and the net rate over 2.0.

It is obvious that no population dependent on agriculture and inhabiting a limited and already densely settled area could reproduce indefinitely at the rate implicit in these figures. Potential growth was more rapid than the actual growth of the thirties, though, for any social and economic changes that would improve levels of living and contribute ultimately toward a reduction in fertility would produce immediate and more rapid declines in the death rate.

THE PROSPECTS: PREWAR JAPANESE VIEW

The balance between the people and the land in prewar Taiwan may have appeared precarious to the Western student but the Japanese foresaw many decades of further expansion before the Malthusian pressures of the people on the food supply would limit either population growth or exportable surpluses. Rice production had increased from 2.1 million koku in 1900 to 4.9 million in 1923 and 9.7 million in 1940. In the latter year the export surplus amounted to five million koku. By 1950 rice production would amount to 12.8 million koku and the quantity available for export to Japan Proper would increase by almost a million koku. 433 241 439

The Japanese also realized that Asian hegemony implied a destiny beyond the agrarian for the once subject peoples and that Japan's own demographic

48: Chen E-4 (no date) 1955 AD1 Formosa AD1

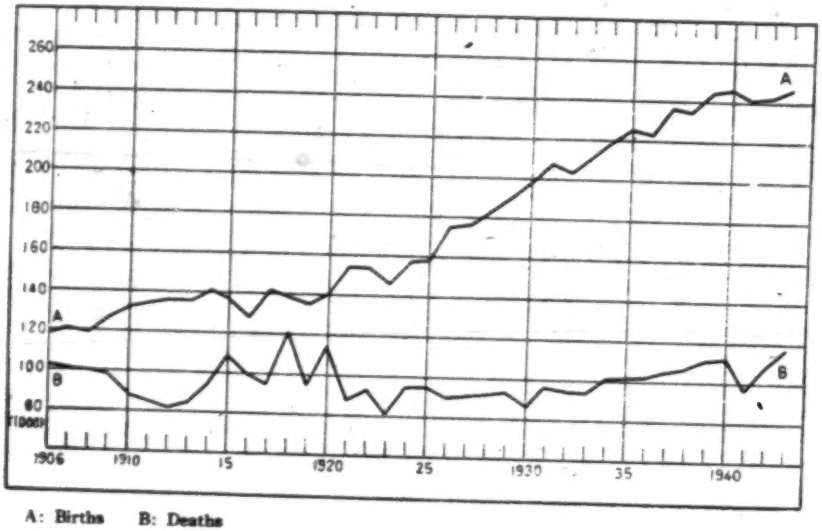
century and a half, and will attain the figure of present world population within two and a half centuries (1: p. 13; 2: p. 45; 4: p. 73–74). As a matter of course these suppositions assume that the present conditions will continue, and that a change of conditions will cause population growth to show another aspect. With regard to the estimation of future population, Sun-Ken Quo has a different point of view based on a different perspective (3).

5. The Cause of Population Growth.

Natural increase and immigration are two causes of population growth. Since the colonial government strictly controlled the emigration of Taiwanese to the mainland and the immigration of mainlanders to Taiwan, migration was quite insignificant for the population growth of Taiwanese, and 96% of its total growth was the result of natural increase[4].

Now, how was this natural increase achieved? From Figure 1 we can see that between 1906 and 1943 the annual number of deaths of Taiwanese did not show any remarkable change, it remained around one hundred thousand. In contrast with this,

Fig. 1: Number of Births and Deaths of Taiwanese, 1906-1943



A: Births B: Deaths

Source, 14: Table 96

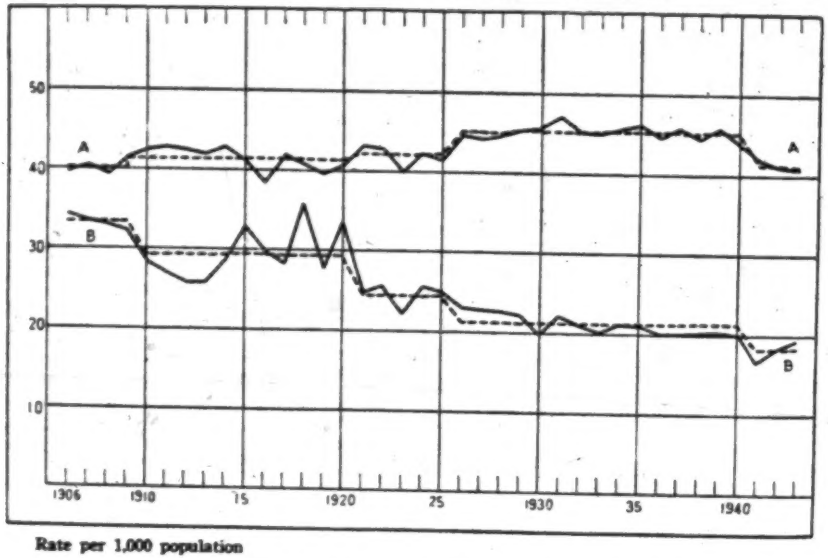
Note 4: The total of the annual increase of Taiwanese population between 1906 and 1943 was 3,078,406 (14: Table 49, 3). (The Taiwanese population in 1905 was 3,055,461, the increase between 1906 and 1943 was 3,078,406, and the grand total of these two figures, 6,133,867 was the Taiwanese population in 1943. 14: Table 49, 2. cf. Table 1, A, column 11 of this paper). Total of the annual natural increase of the Taiwanese between 1906 and 1943 was 2,947,998 (14: Table 96) was 95.76% of the total increase. Total annual increase other than natural increase of the same period was 130,408, and occupied only 4.24% of the total increase.

48: Chen E-4 (no date) 1955 AD1 Formosa AD1

the number of births has increased markedly, it was around 120 thousand by 1906, it had doubled to around 240 thousand by 1943. The number of deaths remained about the same and the number of births was doubled; this was the cause of Taiwanese population growth.

Analyzing the rates of birth and death, the situation will be clearer and easier to grasp. Though the number of births was doubled between 1906 and 1943, the birth rate remained almost the same, around 40 per thousand. Though the birth rate has remained the same, the number of births has increased in accordance with the increase of population. Despite the annual increase of population, the number of deaths has remained almost unchanged. This indicates a decline in the death rate (cf. Fig. 2). The death rate of Taiwanese was 34.4 per 1,000 in 1906, it dropped to 18.4 per 1,000 by 1942, a decline of 16 per 1,000. The birth rate remained almost the same and death rate dropped 16 per 1,000. This is the cause of Taiwanese population growth. The result is clearly shown in the amount of natural increase. The space between line A and line B of Figure 1 represents the amount of natural increase, and the space between line A and line B of Figure 2 represents the rate of natural increase (cf. Table 3). Decline of death rate was the key factor of the Taiwanese population change during the half century under Japanese rule.

Figure 2: Birth and Death Rates of Taiwanese, 1906-1943



Rate per 1,000 population

A: Birth rate B: Death rate (The dotted lines represent the average rate of each period.)

Source, 14: Table 64

6. Population Change and Social Change.

From Figure 2 we can observe the trend of the death rate between 1906 and 1943. The graph naturally divides into five periods each with its characteristic type of change

48: Chen E-4 (no date) 1955 AD1 Formosa AD1

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163
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as indicated in Table 3. The birth rate also shows the same periodical tendency. It is very significant that there is an intimate interrelation between population change and social change in each period, and we even may infer that population change is the index of social change. This will be analyzed in subsequent sections. The average rates of birth, death, and natural increase (Table 3) and main features and changes of each period will be clear from the following table.

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178

Table 3: Five Periods of Taiwanese Population Change.

Period	I	II	III	IV	V
Years	1906–09	1910–20	1921–25	1926–40	1941–43
Number of years	4	11	5	15	3
Average Birth Rate (per 1,000)	40.25	41.40	42.08	45.24	41.10
Average Death Rate (per 1,000)	33.35	29.37	24.61	21.20	18.23
Average Rate of Natural Increase (per 1,000)	6.90	12.03	17.47	24.04	22.83

First Period (before 1909): Wide spread epidemics and malaria, frequent revolts of the people against the Japanese characterize this unstable period. The birth rate was high (more than 40 per 1,000), but the death rate also high, more than 30 per 1,000 on an average, and the fluctuation was remarkable and frequent. The rate of natural increase was about 7 per 1,000.

Second Period (1910–1920): Epidemics were wiped out by the end of this period, the prevention of malaria had started. The uprisings of the Taiwanese were suppressed around 1915, the revolts of the aborigines were largely mitigated by 1920, and comparative social stability was more or less attained. Political, cultural and social movement of the modern type began for the first time after World War I, and took the place of armed uprising. The Japanese colonial policy had changed somewhat. Birth rate increased slightly, death rate declined to an average of around 30 per 1,000, and the rate of natural increase rose to 12 per 1,000.

Third Period (1921–25): Vigorous cultural and social movement marked this era. This was a period preparatory to the following period of expansion. Transportation was improved, mobility of people increased. Agricultural products and processed agricultural products increased, the productivity was raised, and the consumption of daily necessities increased slightly. The attitude of the people began to change, they began to adopt new ways of life more readily. Use of mechanical facilities gradually increased, and the number of doctors of western medicine exceeded the number of physicians who practiced Chinese medicine. The spread of primary education was promoted. The birth rate increased again, the death rate was 4.8 per 1,000 lower than the foregoing period, and the rate of natural increase rose 5.5 per 1,000.

Fourth Period (1926–40): During this period there was a tremendous increase in the output of agricultural products, attaining the peak production during the Japanese rule. The hydroelectric plant of Sun Moon Lake was completed in 1934, and industry

48: Chen E-4 (no date) 1955 AD1 Formosa AD1

161 178 was much promoted by it. Prevention of malaria was successful to a large extent, the activities of preventive hygiene being started by the 1930's. There was reduction in the number of cases of diarrhea, enteritis, and tuberculosis. Infant mortality began to decline. The birth rate rose to a peak, the death rate declined again, and the fluctuations became fewer and of lesser extent. The rate of natural increase attained a peak of 24 per 1,000. Age composion changed, the proportion of infants and children increased markedly.

Fifth Period (1941–1943): The value of industrial products exceeded the value of agricultural products, and the quick tempo of urbanization began. The birth rate began to decline, and death rate continued to drop, to around 18 per 1,000; the rate of natural increase declined slightly. Infant mortality declined further. In comparision with 1906, the average expectation of life of Taiwanese at birth in 1940 was 13 years longer for males and 16.7 years longer for females.

Objectively considered, there were improvements in Taiwan during the half century of Japanese rule; and it is evident at the same time that under the scheme of colonial administration, the improvements were limited in character. The specific character of this social change can be traced in the population data. In order to let her colony carry out its function, in order to make it a good supplier of rice and sugar which Japan urgently needed, various kinds of basic establishments and developments had to be accomplished, such as the wiping out of epidemics, prevention of endemics, basic sanitation, development of transportation, primary education etc. In order to make her colony a good market for manufactured products, the purchasing power and the level of living of the people had to be raised somewhat. But if the "improvement" was pushed too far, it would enable the people to resist and revolt, so it must be kept within certain limits. The Japanese were quite clear on these points, and developed the island within the colonial scheme. The results were successful, even to the extent of Taiwan being called the "ideal colony". Here is the fundamental character of social change in Taiwan. Some data will help us to understand the situation concretely.

161 ● 165 Though the death rate of Taiwanese had declined, its tempo was slow, and still remained very high in comparision with the death rate of Japanese in Taiwan. In the early years of occupation, the death rate of Japanese in Taiwan was tremendously high, but declined quickly and steadily, and with the passage of time the rate was not only lower than in Japan proper, but even attained the level of the most advanced western countries. To take the death rate of 1925 for instance, it was 24.84 per 1,000 for Taiwanese, 20.27 per 1,000 in Japan proper, but was as low as 11.34 per 1,000 for the Japanese in Taiwan. Though it is somewhat higher than Australia (9.2 per 1,000) and Netherlands (9.8 per 1,000), it is still lower than Sweden (11.7 per 1,000), England and Wales (12.2 per 1,000). The age composition of the Japanese in Taiwan was specific, [162] there were more youths and adults in its population, and no doubt this was one of the causes of its low death rate. But even after the difference of age composition was

48: Chen E-4 (no date) 1955 AD1 Formosa AD1

corrected, the standardized death rate of the Japanese in Taiwan was 13.34 per 1,000, still far lower than the rate of 20.27 per 1,000 for their brothers in Japan proper[5]. The rate of infant mortality of the Japanese in Taiwan was also comparable to that of most advanced western countries. From this we can see that Japanese in Taiwan were under tremendously favorable circumstances. Their excessive benefits were enjoyed only at the expense of the land in which they lived.

Social change in Taiwan after the restoration in 1945 will help us to understand the character of colonial type of change. Under Japanese rule, manufacturing industry had attained a fair development, but it produced mostly processed agricultural goods or semi-manufactured goods, and finished consumer's goods were mostly imported from Japan. Fertilizer and textiles were two main import items. If the production of 1941 is taken as base, after the restoration, the production of textiles increased ten times and fertilizer increased five times by 1953 (7: p. 26). This is a sign that the economy of Taiwan has outstripped its colonial and dependent character and has become an autonomous system. In respect to education, the enrollment of Taiwanese school age children in primary school had attained 80% by the later years of Japanese occupation, but the secondary and higher education were very poor. After the restoration, if we take the figure of 1937 as a base and compare it with 1953, the growth of the number of students was as follows. Primary school: more than doubled; vocational and normal school: more than three times; middle school: six and an half times; college and junior college: more than eight times; university: more then twenty one times (7: p. 302). In order to rectify the defects of the colonial era, higher education was especially promoted.

The Japanese are no exception to the rule that each nation struggles for its own benefit. Now that the colonial era is at an end, it is our task to analyze the elements of social change in that era. Some useful references for planning of further social development may be drawn from our analysis.

III. SOCIAL CHANGE IN TAIWAN

Some aspects of social change which relate directly to population change, will be discussed in the following section.

7. *Political Background*

It is self-evident that population growth is deeply influenced by peace and war. The Japanese occupation of Taiwan in 1895 was met with a series of severe revolts. Between 1895 and 1901, the city of Taipei, the capital, was raided twice, the city of Taichung was also raided twice. Other military posts, local governmental offices and posts of military police were raided more than fifty times. A bigger uprising was suppressed in 1902, and after that several years passed in comparative tranquility. An insurrection broke out in 1907, and there were seven revolts between 1907 and 1915. During this period there were frequent uprisings against economic exploitation, as when

Note 5: Tachi, M.: Lecture on Population Problems, Tokio, 1943. p. 201.

48: Chen E-4 (no date) 1955 AD1 Formosa AD1

but God disposes", "Der Mensch denkt, und Gott lenkt", "Der Mensch schaltet, Gott waltet", was fostered under such circumstances. In Taiwan there was a saying: Confucius did not accept an invitation for the next day, since he didn't know whether he would be still alive in the evening or not. Under these circumstances, the attitude of the people is always "looking backward", and planning for the future will be laughed at as utopian. Once epidemics were wiped out, the death rate not only lowered, but its fluctuation became more infrequent and of lesser extent. This is a sign of more stability of life, and thus the traditional fatalism gradually dies out. The attitude of the people changes from "looking backward" to "looking forward", and planning for the future becomes a realistic idea. Ancestor worship and all kinds of cult and ritual are the main concern of people who are always looking backward, but for the peole who are looking forward, the upbringing and education of the younger generation is the most important.

9. Prevention of Endemic Disease

Malaria was the main endemic of Taiwan. Though epidemics are disastrous enough, their prevalence is intermittent, and the extent of their devastation is not necessarily very large. In contrast, malaria creeps in slowly, destroys vitality and attacks human life directly and indirectly. From the time of the Japanese occupation (1895) until 1916, about one tenth of all the deaths in Taiwan were caused by malaria, and during this period it was always the first or second in rank among the leading causes of death. Unaccustomed to the climate of Taiwan, the Japanese in Taiwan had to pay a heavy toll to malaria. In 1899 for instance, one quarter of the total deaths of Japanese in Taiwan were caused by malaria. In 1907, under the supervision of a professor of medicine, prevention of malaria was started by a camphor manufacturing corporation in a village of southern Taiwan, and some results were obtained. Preventative activity by the government-general was started at Peito, a town near Taipei, in 1910. As it was found effective, the regulations for the prevention of malaria were enacted in 1913, and were enforced through the system of police and paochia. The area of prevalence was designated, inhabitants within the area were complelled to have a blood test, and the patients were compelled to take medicine. The use of mosquito nets, drainage, and other sanitary works were enforced. The means adopted were harsh, but the result was good. The malaria death rate began to decline after 1916, considerable improvement has been made since 1925, and as a result the crude death rate was lowered. (cf. Fig. 11).

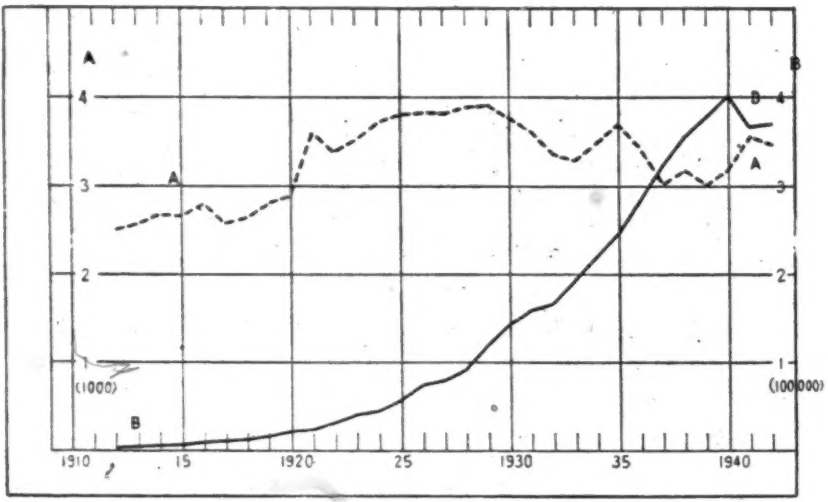
10. Activities of Preventive Hygiene

The devastation from epidemics and malaria was great, and thus the activities for their prevention were begun first. Some simple facilities for patients of leprosy and mental disease were also provided in earlier years. Other diseases, such as tuberculosis, venereal diseases, trachoma, and parasitic diseases, did not show any serious devastation, and they were not considered as serious problems by the government. The administration in Taiwan was mainly an imitation of that in Japan. What they had

48: Chen E-4 (no date) 1955 AD1 Formosa AD1

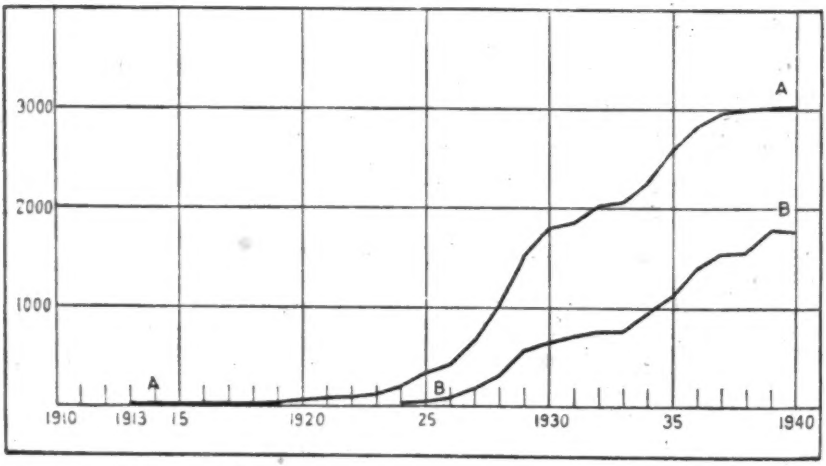
During the early years of Japanese occupation, the difference in the rates of birth and death in different localities was remarkable. As time passed, the development of different localities was gradually equalized, so the

Fig. 4 Number of Rickshaws and Bicycles, Taiwan, 1912-1942



A: Rickshaws (unit: 1,000) B: Bicycles (unit: 100,000)
Source, 14: Table 457

Fig. 5 Number of Automobiles and Trucks, Taiwan, 1913-1943



A: Automobiles B: Trucks
Source, 14: Table 457, 455

48: Chen E-4 (no date) 1955 ADI Formosa ADI

rates of birth and death were more and more equalized. The difference between the highest and the lowest birth rate among different localities was 13.4 per 1,000 in 1906, but had fallen to 8.5 per 1,000 in 1935; the difference between the highest and the lowest death rate among different localities was 32.6 per 1,000 in 1906, but it was only 8.9 per 1,000 in 1935 (see Table 4, cf. 1: p. 169).

Table 4: The Highest and the Lowest Birth Rate, the Highest and the Lowest Death Rate of Different Prefectures of Taiwan in Selected Years (Rate: per 1,000 population)

		1906		1935				1906		1935	
Birth Rate		Whole Province	39.3	Whole Province	45.2	Death Rate		Whole Province	34.0	Whole Province	20.5
	The Highest	Nanto Prefecture	47.7	Tainan Prefecture	48.1		The Higheat	Chiai Prefecture	52.9	Taitung Prefecture	24.4
	The Lowest	Yansuika Prefecture	34.3	Taipei Prefecture	39.6		The Lowest	Hsinchu Prefecture	20.3	Penghu Prefecture	15.5
	Differece		13.4		8.5		Difference		32.6		8.9

Source: 10:1906, 1935.

13. *Agriculture and Industry*

To get primary agricultural products and processed agricultural products, especially rice and sugar, which Japan needed urgently, was one of the main policies of Japan in Taiwan. The colonial government had spent much of time and money for the promotion of the production of rice and sugar. They made various kinds of surveys, researches, and experiments, used the system of police and pao-chia for enforcement, and as a result, the outputs of rice and sugar had increased tremendously.

Among the various types of production in Taiwan, agriculture and manufacturing were the two main types, and the proportion occupied by forestry, fishery, and mining was rather small. In 1912, the value of the total output of all types of production amounted to 146,374 thousand yen. Among these, the proportion of agriculture was 63%, manufacturing was 32%, and the total of three other types (forestry, fishery, and mining) was only 5%. By 1942, manufacturing had developed fairly well, its production value had exceeded that of agriculture. The value of the total output of all types of production in 1942 was 1,515,627 thousand yen. Agriculture's share of this was 42%, manufacturing was 46%, and the total of three other types was 12%. Agriculture and manufacturing, the two main types of production, were again represented by rice and sugar respectively. The proportion of the value of rice to the total value of agricultural products was 59% in 1912, and 39% in 1942. The proportion of the value of sugar to the total value of manufactured products was 79% in 1912 and 42% in 1942. Considering these facts, it seems not unproper to take rice and sugar as representative of Taiwan production.

From figure 6 we can see, that in comparision with the increase of acreage of cultivation (line A), the increase in the output of rice (line B) was tremendously high.

52:Barclay S-5 (no date)1954 AD1 Formosa AD1

CHAPTER VI

Public Health and the Risks of Death

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In the preceding pages, we have given attention to various features of intercourse between Taiwanese and Japanese in Taiwan. Most of the evidence has been in agreement on one point—the policies of Japanese as rulers of the island failed to make any substantial difference in the social structure of its people. The more it seemed to change in some particular, the more it turned out to be essentially the same thing. As a matter of official design many innovations were concentrated in the hands of a favored few. Even when it came to implementing their aims, Japanese found ways to meet the population on its own terms. Much of their success in colonial administration was due to the ability to make the social system serve their purposes without changing its form.

The most significant exception was their effort on behalf of the health of the inhabitants. Japanese have never received full credit for their achievement in this realm, either on the part of the Taiwanese (who resented the intrusions that it involved in their lives) or from Western students of population and public health (who mostly ignored or belittled it). The "benefits" of rationalizing Taiwanese agriculture may be a matter of dispute, for it enormously enriched a few Japanese at the same time that it broadened standards of consumption in the population. The motives of Japanese in introducing to Taiwan some of the advantages of scientific discovery from the outside world may likewise be suspect, for they managed to keep control over most of the fruits of improvement. But there is no doubt that in the field of public health Japanese rule added many years to the expected lifetime of Taiwanese. This, in an environment of opinion that looks with approval upon any postponement of death, deserves to be given adequate attention.

Early Health Conditions in Taiwan

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Prior to 1895, Taiwan was renowned as an unhealthful place to live. It presented special hazards to survival in addition to those which its people had learned to accept in South China. Unusual efforts had been called forth in expanding settlement into the relatively empty area, and these entailed unusual risks of death. Early Chinese migrants to Taiwan had to attend to clearing new lands,

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721 165 and to contend with many types of hardship not found on the mainland. As they pushed toward the island's foothills, they also suffered the consequences of many bloody incidents of violence that they provoked among aboriginal tribesmen.

164 Even in the lowlands, where activities were comparatively settled and routine, life itself was a very uncertain thing. From their environment people were subjected to attack by several kinds of fatal sickness. Through certain traditional practices they unwittingly exposed themselves to many others. The semi-tropical climate of Taiwan favored the spread of a multitude of disease-producing agents. Accustomed methods of cultivating the land—especially those having to do with the conservation of human wastes as fertilizer—encouraged the transmission of these organisms to humans.[1]

Through conditions such as these, the population harbored many body parasites and other sources of infection. As a result, many people passed their lives chronically enfeebled, and others remained constantly exposed to the onset of illness. Certain types of disease often spread over the island, restrained only by the isolation of many localities and the difficulty of travel. From time to time, some would grow to spectacular epidemics in which thousands perished. Disease even proved to be one of the best defenses that Taiwan had against attack by the troops of Western powers, and delayed the Japanese in taking control of the island.

Plague was the foremost among these epidemic diseases.[2] Taiwan was repeatedly swept by attacks of this illness, with heavy fatalities. An uncontrolled traffic of shipping from the mainland and from elsewhere in Asia, much of it illicit, made it easy to introduce infected rats and persons. Conditions of knowledge and sanitation in Taiwan were wholly inadequate to cope with the problem.[3]

Cholera was the second most important disease that occurred in epidemic proportions. Lacking knowledge or facilities to control the spread of cholera, Taiwanese sometimes suffered the full course of epidemics throughout a whole season without being able to take counter-measures.[4] Cholera also was well known and feared in the

[1] For an able popular account of some of the connections between custom and the "food cycle" that propagates these organisms, see Winfield, G. F. (1948), p. 112 ff.

[2] See Hsü Tze-wei. (1936), p. 444.

[3] For some of the futile steps adopted against plague by the people, see Campbell, W. (1915), p. 77.

[4] Drinking water was usually taken from the rivers or from shallow wells, making them easily subject to pollution. See Takekoshi, Y. (1907), p. 285.

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early Western contacts with Taiwan. It all but wiped out some of the military expeditions sent there as tentative colonial ventures by European powers, and later helped to persuade the Japanese to embark on large-scale measures of control.

Malaria was ordinarily endemic in Taiwan. The moist heat, and the practice of admitting water into fields for irrigation in pools that were left to stagnate, helped to nurture the mosquitoes that spread the disease. Occasionally malaria broke out in epidemic form. It was likewise impossible to control, but was simply allowed to run its course. Even in the more fortunate years it served to undermine the strength of Taiwanese during much of the year, and probably also their resistance to other sickness.

In addition to these major diseases, Taiwanese were widely afflicted with the more common debilitating ailments that tend to shorten life and lead to complicating illnesses in Asia. Enteric diseases and internal parasites were always prevalent, as in China. Tuberculosis and venereal disease were later found to be widespread, and presumably had existed also at this earlier period. Superficial skin and eye maladies were frequent. Taiwan's position as a transshipping point in the opium trade introduced a plentiful amount of the drug for local consumption, which impaired the health of the inhabitants still further. In the census of 1905, it was found that nearly one-fifth of all Taiwanese men over age 30 were known users of opium, and there were probably others who managed to conceal the fact. As external trade increased, surreptitiously and openly, Taiwan became exposed to a wider variety of diseases and a greater number of transmitting agents from outside. At the same time, the official policy of seclusion also kept out the techniques that the West was evolving to deal with them.

These baneful health conditions added new hardships for the people who migrated to Taiwan. The risks of death thus engendered became a formidable feature of everyday living. Moreover, under the pressure of poverty many families apparently eliminated certain unwanted offspring, either through exposure or deliberate neglect. As a result, a large proportion of those who were born into the population never survived to adulthood. The dangers to life were such that probably Taiwan gained few if any people through natural increase; very high fertility was needed merely to offset the losses through death.

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The Japanese and Public Health

165 The Japanese military forces that first set out to subdue Taiwan met no firmly organized resistance among the people, but were nearly overcome by sickness in their own ranks before taking possession of the island. Out of an undisclosed total number of troops taking part in the campaign, the Japanese acknowledged only 154 combat fatalities, but over 4,000 died of disease within the first several months, and 27,000 had to be hospitalized (most of them in Japan).[5] Epidemic illness did not, like poverty, stay confined to the Taiwanese population and leave the new rulers unmolested. Mosquitoes that carried malaria, for example, did not observe this distinction. The Japanese liking for raw fish was said to make them even more vulnerable than Taiwanese to the parasites that infested the food. Among the garrison alone, annual deaths of more than 40 per thousand were reported during the first decade of occupation, probably a higher figure than in the adult population of Taiwanese. In order to make this region of the world safe for imperialism, the Japanese found that they had to take drastic measures to curb the spread of disease.

657 744 They started almost at once to devise ways of counteracting the most serious sources. The steps that they adopted are instructive, for the result was a marked success with only a modest outlay. The campaign against sickness was launched when scientific knowledge as to the nature of these diseases was by present standards still rudimentary. Its weapons were crude and sometimes misguided. Moreover, there were many other goals of administration that competed with public health for attention. The authorities were never in a position to divert large blocs of funds to make their program elaborate or munificent. It lacked the grandeur of projects sometimes contemplated by those who draw up plans for "backward" areas today. The whole approach of the Japanese to the problem of disease in Taiwan was an austere one. They avoided every possible expense in equipment and physical facilities, and depended on intensive use of all the administrative resources at their command.

744 In slightly over a decade the authorities almost eradicated plague as a major disease, through strict vigilance for suspected cases of infection, rigorous quarantine regulations, and careful inspection of incoming ocean cargoes for infected rats.[6] Cholera was similarly pre-

[5] Davidson, James W. (1903), p. 354.
[6] Naito, Hideo (1937), p. 84 ff.

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tation were confined to some of the major cities, the influence of these broader health measures gradually spread evenly over most of the island. In this way Japanese gained results that were very substantial through the use of none but crude techniques.

The Japanese policy toward opium addiction was less consistent, for here they found welfare goals to be in conflict with profit motives. They made the manufacture of opium a government monopoly, and closely regulated its sale. The announced purpose for this control was to eradicate the use of the drug, but the Taiwanese occasionally complained that officials secretly abetted its consumption. The truth of the matter is not clear, but their success in other tasks suggests that opium addiction could have been stamped out far more quickly if they had made a determined effort to do so. Some of their own records show that new users of opium were being granted licenses as late as the 1920's. It is likely that the Japanese appreciated the effectiveness of addiction in enervating the resistance to their rule among wealthy families, and they made no secret of the steady public revenues that they derived from opium sales.[12]

The Evidence for Measurement of Mortality

There is not much point in describing the purposes and methods of public health work without having some independent appraisal of results. Such efforts have often been sponsored elsewhere with much fanfare and little accomplishment. The only trustworthy way to view the results of economic and sanitation policies in prolonging life is through some form of measurement; this is likewise the only precise way of comparing the risks of death in Taiwan and in other areas.

Fortunately the data that exist to gauge mortality in Taiwan are excellent. The occurrence of many kinds of illness involving danger of contagion was required by law to be reported to the authorities. Partly as a means of avoiding contamination of the living by the dead, and partly just as a means of tightening official control over the reporting of disease, the Japanese also strictly regulated burials and cremations.[13] The rigors of enforcing these rules led to concealment of some illness and evasions by mis-stating exact causes of

[12] A careful study of opium addiction in Taiwan and its relation to mortality is contained in Tu Tsung-ming (1935 and 1938).

[13] See Hsü Tze-wei (1946), p. 449.

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death;[14] but at the same time they led to registration of deaths that was virtually complete.

A person while living had a legitimate civil status only by being entered in an appropriate police register. Deceased, his absence could be legitimized only by removal from these rolls, and his burial could be permitted only by following this prescribed procedure. All of these records were kept by the police or by affiliated agencies. The police were alert and well-deployed to prevent evasions. Since such records were useful to them in surveillance of the population, they employed the *pao-chia* system to make the registration effective. The people in each locality were thus compelled to accept conformity with these requirements as a matter of their own collective interest. Consequently a person's identity in these records from birth till death was almost never subject to confusion or concealment.

This consistency of information in all the population registers has a special significance for demographic research. It means, for example, that each person's death record was matched to the record of his birth, so that the exact number of years elapsed between the two events can be calculated. The same legal identity of a person formed the basis for his entry in every census enumeration. "Age," as a census category, was not set down according to an individual's recollection of the number of birthdays experienced. Instead, the pertinent fact that was entered was his date of birth, and age was ascribed to him in the process of tabulation at the central census office.

Age in Taiwanese population statistics was therefore explicitly defined: it was a classification of equal intervals, in which each person ideally had one and only one "true" position at a time. It was possible for age to correspond perfectly in the recording of all three kinds of events of interest here—birth, enumeration at census date, and death. An unambiguous scheme of this sort for reckoning age is especially important in a population of Chinese, because most Chinese compute their ages in a manner that cannot be reconciled to Western usage. Starting with age one at the date of birth, it is customary for them to add a year of age with the passage of every (lunar)

[14] Once cases of smallpox, scarlet fever, typhoid fever and certain other diseases were discovered, the people were forced to undergo disinfection of lodgings and personal effects that was often destructive. Hence, it has been alleged that diagnoses were deliberately falsified to avoid these consequences (see OPNAV, Civil Affairs Handbook, 1944, *Shinchiku Province*, p. 54; U.S. War Department, TB Med 30, p. 6). A more important source of inaccuracy was probably (in the case of deaths) ignorance as to the nature of a decedent's illness. Tuberculosis was said to be very prevalent, and yet few deaths were ever diagnosed as due to this cause.

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659 165 A welcome feature of Taiwan's mortality and census data is that they lend themselves to a detailed test for accuracy. First, they can be checked against the number of people counted in one census who died before the next one. For any given cohort of births, if the data are all correct, this should be equal to the number of survivors counted in the earlier minus the number counted in the later census. The censuses of 1905 and 1920 are compared in these terms in Table 34, for males only; the result is almost identical for females. The column of ratios indicates the degree to which registered deaths account for the difference in the numbers of survivors counted at successive census dates.

If all records were complete and accurate, the ratios would be unity at every age. If the differences in census survivors are assumed to be correct, then apparently a few deaths went unregistered in certain years. It is obvious that the records were not perfect. As it is, they were so nearly complete that there is little if anything to be gained from trying to make corrections for the discrepancies. Since this is simultaneously a test of census enumeration and vital registration (and an extremely sensitive test of age reporting), it is not possible to decide whether the discrepancies arose from deaths that were omitted or people overlooked from the earlier census.[18]

Since mortality in the first year of life is usually measured on the basis of the number of live-born babies, it is necessary also to know how adequate the birth statistics were in relation to death and census records. A test for births, similar to that above, is shown in Table 35; the results give an excellent account of the birth registration. The registration of birth entered a child permanently in the police lists, and was an almost inescapable bond during his later life. By this criterion, the chances of evading subsequent controls allied to

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tables for Taiwanese, for the yearly intervals had the same upper and lower limits as those of the vital statistics.

Japanese were apologetic about the deviation of this system from the Western mode of age reporting, and beginning with 1930 "modernized" the system so that its special virtue was eliminated. Starting with the census of that year, census-year rather than calendar-year intervals were used, making the system identical with the Western conventions in design. For dates after 1930 it is no longer possible to relate deaths precisely to enumerated census population.

[18] There is reason for not putting all the blame on registered deaths, for the area of effective administration was expanded slightly after 1905, and by 1915 and 1920 had brought more people into the registration and census system than the survivors of those enumerated in 1905. This being the case, it is possible that both measuring instruments were nearly perfect, and that the discrepancies arose entirely from the expansion of administration.

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TABLE 34

TEST FOR ADEQUACY OF DEATH REGISTRATION OF TAIWANESE 659
Males by Year of Birth, Surviving at Census Dates in 1905 and 1920, 165
and Intervening Deaths as Registered

Year of Birth	*Survivors 1905*	*Survivors 1920*	*Difference*	*Registered Deaths 1905-1920*	*"Completeness" of Death Registration**
1904	48,859	38,257	10,602	11,602	1.094
1903	43,432	35,769	7,663	7,768	1.014
1902	43,340	36,392	6,948	6,718	.967
1901	41,658	35,523	6,135	6,087	.992
1900	41,910	36,224	5,686	5,564	.979
1899	38,149	32,899	5,250	5,099	.971
1898	40,913	35,409	5,504	5,257	.955
1897	34,183	29,707	4,476	4,801	1.073
1896	33,855	29,149	4,706	4,872	1.035
1895	35,579	30,148	5,431	5,177	.053
1894	32,338	27,187	5,151	5,052	.981
1893	32,581	27,062	5,519	5,444	.986
1892	34,122	27,945	6,177	6,224	1.008
1891	32,421	25,963	6,458	6,263	.970
1890	31,626	24,672	6,954	6,540	.940
1889	32,164	25,479	6,685	7,273	1.088
1888	34,355	25,907	8,448	8,040	.952
1887	35,471	27,101	8,370	8,584	1.026
1886	33,697	25,254	8,443	8,587	1.017
1885	33,445	24,708	8,737	9,016	1.032
1884	36,969	27,156	9,813	10,023	1.021
1883	34,750	25,257	9,493	9,911	1.044
1882	32,431	23,034	9,397	9,922	1.056
1881	35,951	25,034	10,917	11,100	1.017
1880	31,335	21,484	9,851	10,242	1.040
1879	31,345	21,230	10,115	10,287	1.017
1878	29,016	19,036	9,980	9,961	.998
1877	27,669	18,379	9,290	9,988	1.075
1876	31,238	20,263	10,975	11,239	1.024
1875	27,991	17,880	10,111	10,741	1.062

* Ratio: Deaths/Difference.

Sources: *Census of 1920, Descriptive Report*, Appendix, Table 15.
Vital Statistics, yearly volumes, 1906-1920.
Statistical Summary, Table 58, for population by age in 1905.

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TABLE 35

TEST FOR ADEQUACY OF BIRTH REGISTRATION OF TAIWANESE Births from 1906 to 1920, as Registered and as Estimated from Survivors Enumerated in Census of 1920 and Intervening Deaths

Year of Birth	*Survivors 1920*	*Registered Deaths Since Birth*	*Estimated Births (1) + (2)*	*Registered Births**	*"Completeness" of Registered Births†*
			Males		
1920	46,832	7,725	54,557	54,064	.9910
1919	55,006	12,993	67,999	70,349	1.0346
1918	52,260	18,219	70,479	71,764	1.0182
1917	52,245	19,854	72,099	73,430	1.0185
1916	46,234	19,805	66,039	65,837	.9969
1915	48,109	22,322	70,431	70,855	1.0060
1914	49,637	23,109	72,746	72,755	1.0001
1913	48,427	21,550	69,977	70,170	1.0028
1912	48,810	20,961	69,771	69,990	1.0031
1911	48,388	21,159	69,547	69,558	1.0002
1910	46,609	20,806	67,415	68,042	1.0093
1909	44,540	20,780	65,320	65,666	1.0053
1908	41,626	20,353	61,979	61,993	1.0002
1907	43,003	20,074	63,077	63,290	1.0034
1906	41,598	20,008	61,606	62,120	1.0083
			Females		
1920	46,017	5,815	51,832	51,410	.9919
1919	53,950	10,346	64,296	66,358	1.0321
1918	50,328	16,028	66,356	67,701	1.0203
1917	49,315	18,099	67,414	68,984	1.0233
1916	44,230	18,658	62,888	62,768	.9981
1915	45,348	21,372	66,720	66,814	1.0014
1914	46,245	22,279	68,524	68,695	1.0025
1913	45,434	21,281	66,715	66,797	1.0012
1912	45,403	21,090	66,493	66,632	1.0021
1911	45,373	20,805	66,178	66,100	.9988
1910	43,251	20,262	63,513	64,099	1.0092
1909	41,268	20,187	61,455	61,620	1.0027
1908	38,292	19,737	58,029	57,807	.9962
1907	38,594	19,981	58,575	58,466	.9981
1906	37,323	19,824	57,147	56,987	.9972

* In 1920, deaths and births have been taken only from January 1 to October 1.
† Ratio: Registered Births/Estimated Births.
Sources: *Census of 1920, Descriptive Report*, Appendix, Table 15.
Vital Statistics, yearly volumes, 1906-1920.

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the registration system were very slight. The same result is found for births of more recent years.

With very few exceptions, these events—births, deaths, and presence at each census date—were nearly all recorded and were recorded accurately. The pattern of omissions is itself significant: whatever their source, they contained practically no age or sex bias. Therefore (with one reservation)[19] we shall accept all published deaths and all population figures as complete and correct for the measurement of mortality. The differences would be trivial if they were distributed as adjustments over all the years of deaths; and the tests give no clue as to how such adjustment should be distributed.

The Decline of Mortality

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The simplest question that arises about the trend of Taiwanese mortality is also the easiest to answer: what happened to the prevalence of deaths in the population during colonial rule? Unfortunately for judging this trend, no one can say what was the level of mortality in Taiwan when the Japanese first arrived. The Manchu government did not even know the number of its subjects, far less their behavior with respect to births and deaths. The colonial regime founded by the Japanese started a thorough system of vital statistics only after a decade of control. Consequently the very earliest usable record began at a time when life had already been made more secure.

The trend of annual death rates after 1905 appears clearly in Table 36. It was not only downward, but was rapid in its fall. Over the same period there were scarcely any recorded instances to equal the speed of this decline. Supposing that there were over 40 deaths per thousand persons in 1895 and before, the yearly incidence must have dropped by more than one-half in the next fifty years.

Thanks to improved drugs and newer approaches to the problems of health, such a feat has since this time become fairly easy in countries of high mortality. Crude death rates of 20 are no longer considered low. But subsequent advances in medicine should not be allowed to detract from this performance. With the resources and

[19] The only reservation is in the case of infants. This requires special attention, and is discussed in the section on infant mortality.

In reality, the ambiguity is a more fundamental one than any amount of "correction" can remedy. It arises from an inherent difficulty in making a precise definition for a "live" birth in a society where infants are delivered without skilled medical care and where the chances of surviving the first day of life are very poor. Where families regard mere discussion of deceased offspring as inauspicious, the prospects for developing precise measuring standards for infant mortality are poor.

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TABLE 36

CRUDE DEATH RATES OF TAIWANESE, 1906-1943*

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Years	Deaths per Thousand Persons
1906–10	33.4
1911–15	28.6
1916–20	31.0
1921–25	25.0
1926–30	22.1
1931–35	21.2
1936–40	20.6
1941–43	18.5

* Unweighted averages of annual death rates for each year. Before 1915, deaths have been adjusted slightly on the basis of the internal pattern of infant mortality in later years, as explained in the text.

Source: *Statistical Summary*, Table 64.

knowledge available in these earlier years it was a far more noteworthy achievement than it now appears. Almost entirely through the reduction of mortality, the annual natural increase of Taiwanese rose to 25 per thousand, which even today is rarely found.

The fall of mortality was not unbroken. It was interrupted in quick succession in 1915, 1918 and 1920 by waves of fatal illness over the island. The first occasion was accompanied by an unusual number of malaria deaths,[20] when the program of malaria control was only in its second year. In 1918 and 1920, the Taiwanese were visited by a part of the world-wide influenza outbreaks at the end of World War I. In all three years the cause-of-death data, defective as they were, revealed exceptional fatalities due to malaria and respiratory ailments respectively, but no serious recurrence of the old epidemic diseases.

None of these setbacks quite matched the initial years of statistical record. Since mortality in 1906 undoubtedly was already lower than it had been in the pre-Japanese period, one can say that for the island as a whole these later reversals were minor and transitory (see Fig. 21).

Taiwanese Life Tables

The life table is a device that represents mortality in a special conventionalized way. Conceptually it is an instrument of precision,

[20] And reportedly some civil disturbance, though such instances are always exaggerated and difficult to evaluate.

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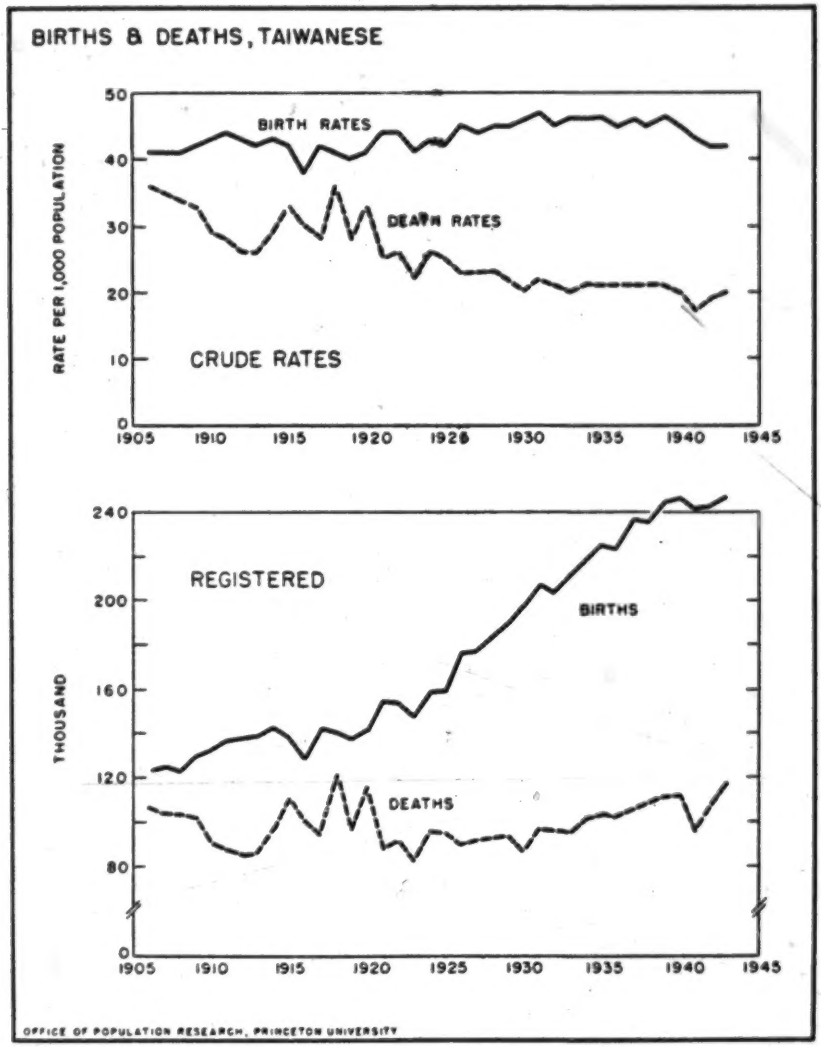

Fig. 21. Crude Birth and Death Rates and Total Registered Births and Deaths of Taiwanese, 1906-1943.

for it allows one to speak in terms of probabilities of dying, which is what we mean here by the notion of mortality. Being conventional, it lends itself easily to comparison with data from other places independent of differences in age structure, even when the procedures of computation are slightly varied. Some caution, of course, must be

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exercised in this application, for the life table is also a way of making poor mortality data look good. Since precise information about mortality has not heretofore existed for a population consisting of Chinese,[21] tables prepared for Taiwanese under differing mortality conditions should be of some additional interest from this standpoint alone.

Life tables are very convenient as a way of summarizing age-specific risks of mortality for each sex in a specified short period. They can also be used to illustrate one aspect of the course of mortality with the passage of time—the age incidence of change. There are more efficient ways of expressing secular change *per se*;[22] where secular change is interrupted by fluctuations of short duration, the age incidence of deaths in a given period is probably the sort of measure to be preferred.

In the case of Taiwan the life table is the most appropriate form in which to express the import of this particular type of death statistics. The data are peculiarly suited, as we have seen, to showing precisely the proportions of persons entering each year of age who died before the next birthday. This proportion is the figure conventionally used to estimate the probability of dying in the given year of age. Having such data as these, one can prepare life tables directly and not by the roundabout and arbitrary procedures that ordinarily must be used.[23]

Actuarial practice has adopted strong graduation formulae to make life-table data appear more regular than they are. Presumably these procedures are grounded on assumptions that mortality risks are fundamentally a continuous function of age. On the basis of wide experience, this assumption seems reasonable enough. However, the justification for smoothing is based also on the assumption that much of the fluctuation in observed data represents chance variations in the risks of death at given ages;[24] actuaries, understand-

[21] Little attention has been given to two official tables that have been published. See Taiwan, Government-General, Research Bureau. *Life Tables of Taiwan, 1926-1930* (First Issue) (1936), 160 pp.; Taiwan, Provincial Government, Department of Statistics. *Life Tables of Taiwan, 1936-1940* (Second Issue) (1947).

[22] A more satisfactory procedure for this specific purpose is to examine mortality of actual cohorts of persons over time, where age and time can be observed while varying together, and their interaction can be taken into account. It is planned to examine this aspect of mortality change in Taiwan at some later date.

[23] Where S_x represents the number of survivors to exact age x, and D_x the number of them who died in age x, q_x (the probability of dying at that age) can be expressed directly as D_x/S_x. The arbitrary conversion of an observed central death-rate, m_x, such as by assuming $q_x=2m_x/(2+m_x)$, then becomes superfluous and can be by-passed.

[24] See Knibbs, G. H. (1917), pp. 86-88.

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ably, do not relish the thought that their work consists merely of manipulating errors of observation.[25]

Taiwan's data throw some light on the relative magnitude of the random and the error components of irregularity in age-specific mortality rates. For example, one life table has been prepared for the period 1909-1911, in order to illustrate the risks of death at a time when they were still high. The mortality rates of this table (see Fig. 22) represent a small number of deaths, as do those of the succeeding tables, and have not been subjected to any graduation.[26]

The people in the lowest to the highest ages of any life table represent groups born over a long period of time, each of which might be expected to exhibit peculiarities of its own previous exposure to mortality. Nevertheless, the risks of death shown in Fig. 22 deviate only slightly from a smooth progression with age. The persons exposed to death at each age were few; in view of their number, much larger variability would appear reasonable. Even if we were to assume a complete lack of error in the data (throwing the whole burden of all deviations from continuity to the element of chance), the random component of these fluctuations is very small. A strong case for the notion of continuity can be made from this life table. But by the same token it appears that the *error* component of deviation from continuity in ordinary data is the major portion. Perhaps not much general significance for the variability of "true" mortality rates by age can be drawn from these data. Very likely, however, smoothing devices as commonly used have as their major function the adjustment for errors of observation. Aside from errors of omission, these presumably arise because information by age is incorrect and because deaths as usually registered do not belong to the people to whom they are assigned.[27]

Taiwan's mortality data have not been widely known. Two official

[25] There is in addition a possible third influence—the cohort effect, or effect of the date of birth. This is generally ignored.

[26] Strictly speaking, they represent the weighted averages of three cohorts of persons entering each year of age, in 1909, 1910, and 1911 respectively. The mortality rates are in the simple form $(D_1+D_2+D_3)/(S_1+S_2+S_3)$ in each year of age. This averaging has the effect of reducing the variability of single-year values as compared with the life tables to be presented later. The effect of different weighting for different cohorts is ignored.

[27] All this is not meant to imply that actuarial procedures are misguided or that smoothing is unwarranted when dealing with inferior data. The actual errors introduced in most instances by graduation of mortality rates are probably not very great. It does seem important, however, to know how close an approximation to continuity accurate data can give, as a basis for inferring that the error component of deviations is not inconsiderable.

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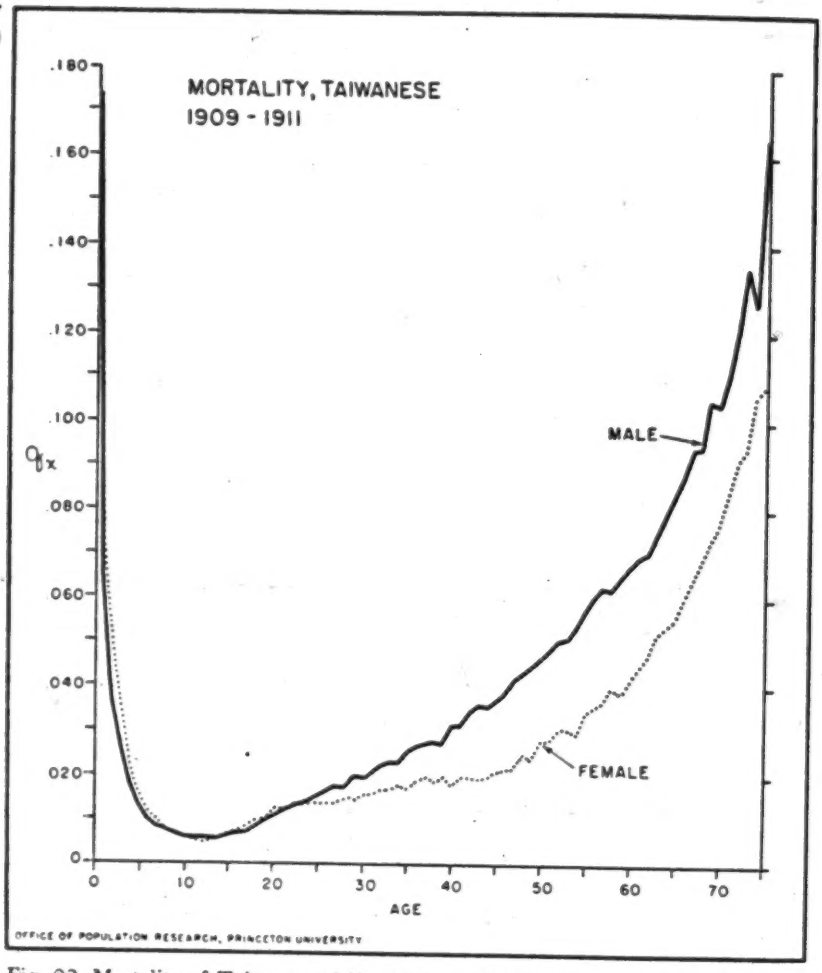

Fig. 22. Mortality of Taiwanese, Life Table of 1910-1911. Values of q_x, by Age, Male and Female.

life tables were compiled and published from them,[28] which have likewise not become well known to Western demographers. Consequently it is desirable to compare the conditions in Taiwan with

[28] These two official tables were constructed by conventional procedures. The 1926-1930 life table, the earlier of the two, covered a period when the information on year of birth had been temporarily dropped from publication of vital statistics. The second table, for 1936-1940, covered a span when the census population could no longer be matched to registered deaths. Hence, the more precise procedure used here was denied to both of them.

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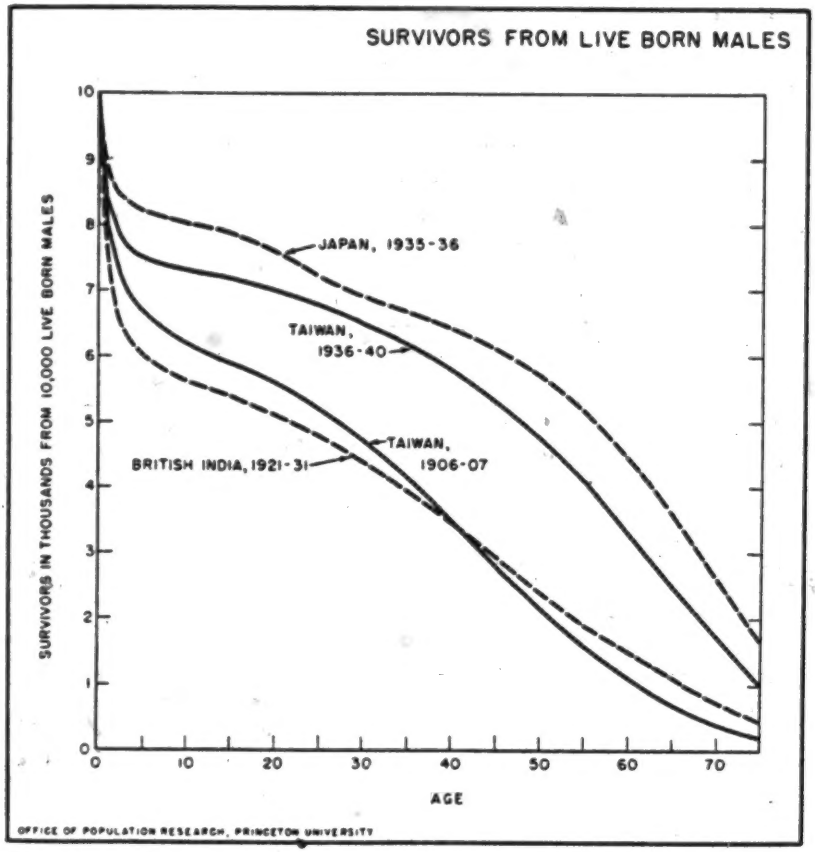

Fig. 23. Life Table Survivors of 10,000 Live Male Births, by Age (l_x). Taiwan and Selected Other Countries.

other examples that are more familiar. This is done in Fig. 23, where life-table survivors of an arbitrary 10,000 male births have been plotted for Taiwan in 1906 and 1936-1940, Japan in 1926-1930, and British India in 1921-1931. Even near the turn of the century, to take the year 1906 as an example, mortality in Taiwan was no higher than that of British India many years later. The gross effects of mortality in Taiwan had by 1940 come to a point closer to Japan during the 1920's than to the previous situation in Taiwan. The median age at death (the age at which mortality rates of the given period would have reduced a starting cohort by one-half) was nearly doubled between these two dates.

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• 165 Such a comparison does not, however, reveal much about mortality in Taiwan itself. It shows next to nothing of the nature or extent of the decline. A better way to examine the shifts by age is to look at the changes in the risks of death. The probabilities of dying show these changes in each age independently of other ages. Graphically this profile of mortality appears for various dates in Fig. 24, plotted

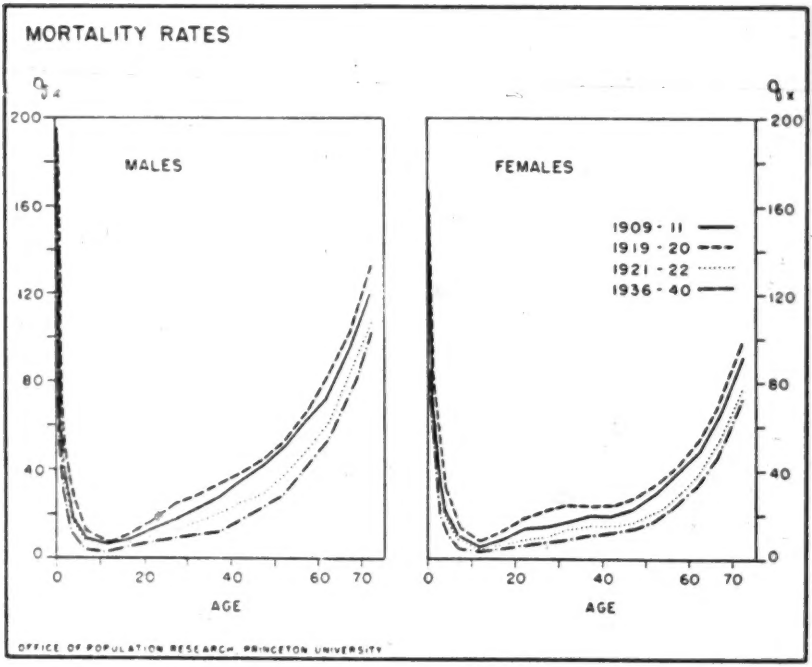

Fig. 24. Mortality of Taiwanese, by Age ($_4q_x$), Selected Life Tables. Males and Females.

on pivotal ages. The earliest point is the three-year period 1909-1911, expressing conditions that were greatly improved over those found in 1906.[29] It represents the effects of selective sanitation works (i.e., in the larger cities), and of mass disease controls of the crudest sort. Epidemics had been suppressed, but the full-scale attack on malaria,

[29] The procedures of preparing these life tables make them reflect the events of two calendar years. They are also based on the persons *entering* each age in the given year, some of whom did not die before the following year. The table for 1906, therefore, is composed mostly of deaths that occurred in 1906, plus some that did not take place until 1907. 1906 was the year of a severe earthquake in one Prefecture, and for this reason may have been less favorable than neighboring years.

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for example, had not yet begun. Not long before, the Japanese had just succeeded in gaining undisputed control of the island outside of the central mountain region. By implication, the conditions in 1909-1911 thus give an indication of what is possible with the most rudimentary types of health measures. At that time most were still experimental, for the Japanese were just beginning to struggle with the problems of rationalizing agricultural practices, and had not had enough time to organize a concerted program against infection and disease.

If mortality had been reduced easily and quickly, the gain was not a very secure one. The reversals in 1915, 1918, and 1920 are shown in Fig. 24 in their incidence by age; they again restored temporarily the unhealthful state that had prevailed before. (Influenza in 1920 struck early in the year, and affected principally those who had not passed a birthday since 1919; the age cohorts of 1919 were the ones that absorbed the force of the disease.) By contrast, when the steady effects of economic and health policies gradually became felt, mortality risks (as exemplified by the period 1936-1940) were brought firmly down to much lower levels. Translated into figures for the mean expectation of life at various ages in each year, the risks of these years are summarized in Table 37.

The pattern of the decline appears only when the mortality rates themselves are viewed in detail. From age 15 to age 50, most people pass through the most active portion of their lives. Adults in a country of relatively high mortality move from ages when death is rare through a stage of steadily increasing risks. By age 50 in Taiwan at least half of the members of each cohort of births were no longer alive. Adulthood is usually associated with two chief hazards of death. In a society like Taiwan, the working activities undertaken by men and childbearing of women begin to bring people of both sexes into contact with greater risks of dying. The interval covers the entire normal childbearing period of women and most of the time of active employment of men.

Deaths occurred in different patterns for men and women in these ages. Mortality actually started at slightly lower levels for women who were approaching adulthood than for men. It also advanced less rapidly with age. In years of moderate mortality this progression with age was nearly continuous; when there were extraordinary hazards, they had the heaviest effect on women of younger ages and

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TABLE 37

MEAN LIFE EXPECTANCY OF TAIWANESE AT DIFFERENT AGES
Selected Life Tables. Values of e_x, in Years

Age	*1906*	*1909-11*	*1919*	*1921*	*1926-30*	*1936-40*
			Males			
0	27.7	32.4	27.7	34.5	38.8	41.1
1	33.2	38.1	33.4	41.6	45.9	47.6
5	35.9	40.0	36.2	44.0	47.5	49.5
10	33.5	36.7	33.4	40.8	43.6	45.6
30	20.4	22.6	20.8	26.2	28.1	29.7
50	12.0	13.2	12.5	15.0	16.0	16.5
			Females			
0	29.0	35.6	29.6	38.6	43.1	45.7
1	34.0	40.7	34.4	45.0	49.4	51.5
5	38.8	44.7	38.9	49.2	52.5	54.6
10	27.2	41.9	36.9	46.4	48.8	50.8
30	25.5	29.0	25.8	31.9	33.5	34.8
50	15.5	17.4	16.4	19.6	20.3	20.6

Sources: Life tables of 1906, 1909-11, 1919 and 1921 were computed from the assembled data of Taiwan's censuses and vital registration. The table of 1926-30 is from Taiwan, Government-General (1936); that of 1936-40 is from Taiwan, Provincial Government (1947).

altered the entire pattern that usually prevailed (see Fig. 25).[30] Thus enlarged from the mortality rates given in Fig. 24, the disparity between male and female age structure of adult mortality also appears more strongly.

In spite of the differences in structure, male and female risks of death have both given the appearance of reacting in the same way to the changes in general conditions of health in the population. And this is very nearly true as far as secular decline in mortality was concerned. But the exceptional risks (as in 1915, 1918, and 1920) affected women very differently from men. Their age incidence remained unchanged for men. For women, these risks were heavily concentrated at some of the later years of the childbearing period.

The most typical pattern of sex selection of age-specific mortality is illustrated in the period 1936-1940 (see Fig. 26). The values are

[30] Fig. 25 is based on age-specific death rates rather than on life-table probabilities. It makes no difference in the pattern of the results. Death rates are adopted for this illustration because they show the events of the exact calendar years that are most appropriate for this comparison.

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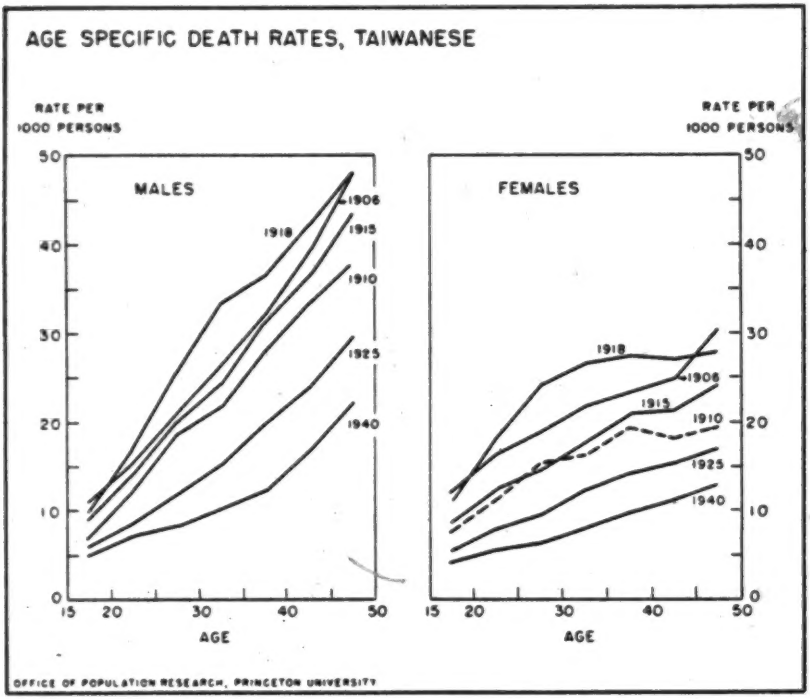

Fig. 25. Age-Specific Death Rates of Adults in Selected Years. Taiwanese Males and Females.

sex ratios of deaths at each age to an equal number of males and females beginning that age during the year in question.[31] The usual sex balance of mortality risks in Taiwan was different from what prevailed in other recorded Asian populations—e.g., Japan and India. It is, of course, not surprising to see that it was not the same as the United States. But the nature of the difference also runs contrary to what might be expected. In particular, it is startling to find that females were normally less likely to die than males at all ages over 15 years. This critical age span, when women of a high-fertility society are entering a period of frequent pregnancy and childbirth, is commonly thought to be likewise a stage of high mortality for them. The evidence as to fertility, which will appear in the following chapter, shows that Taiwanese women did not avoid these risks by avoid-

[31] Above age 4, the actual values plotted are sex ratios of ${}_5q_x$, or mortality rates over age intervals of 5 years each.

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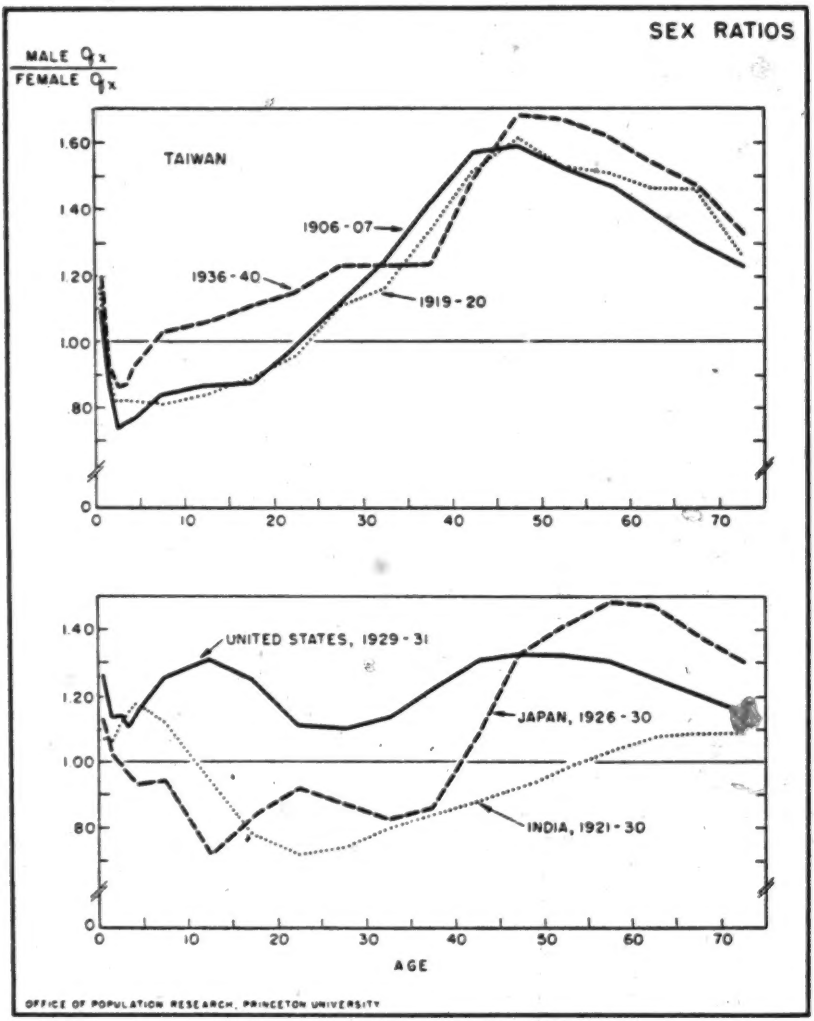

Fig. 26. Sex Selectivity of Mortality in Taiwan and Other Countries. Number of Male Deaths for Every Female Death, Among an Equal Number of Each Sex Entering Each Age.

ing childbirth. Fertility in Taiwan was consistently higher than for all of Japan, and yet in Japan women in childbearing ages were put at considerable disadvantage with men in their chances of survival.[32]

[32] In both societies, the cessation of childbearing is marked, for example at age 40 and above, by a decided improvement in likelihood of survival of women in relation to

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Though Taiwanese women in most years succeeded in warding off more risks of death than men in early adulthood, they did not fare so well during times of greatest sickness or near-epidemic. In both 1906 and 1920 the situation was reversed. In all ages other than infancy up to mid-adulthood, females experienced higher risks than males. Their greater susceptibility in these times is as puzzling as their comparative robustness in other years. It did not move them much closer to the position of Japanese females in relation to males, for the pattern of selectivity was still distinct from that of Japan.

Regardless of the year of observation, young girls consistently suffered greater risks than boys. In the first year of life, as is usually the case, males invariably had inferior average chances of surviving to their first birthday. For the next nine or more years they more than made up for this initial disadvantage. Without fail, there were more male than female survivors to age ten from an equal number of each who managed to enter the second year of life (see Table 38). This was the case for all cohorts of which the record is available from the first birthday to the tenth—26 cohorts in all. Because of this, a higher proportion of boys than girls survived from birth to age ten.

It is easier to reconcile lower rates of survival for young girls with known features of Chinese society than it is the advantage held by women over men at all higher ages. With a few exceptions, the difference in risks was consistent in every year of age. It often extended to age 12 or beyond, after which males generally remained at greater risk for the rest of life. Sex ratios of even numbers of one-year-olds surviving to age ten show a steady movement toward equalizing the risks of death in this interval with the passage of time. It is well known that male offspring are especially cherished in Chinese families, for they provide the basis for family continuity over several generations. The resulting preferential treatment in childhood for boys rather than girls is borne out by the evidence of Table 38, since survival of young girls elsewhere in the world is usually found to be superior to that of boys.[33]

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men. So it is barely conceivable that unhealthful activities of men simply over-balanced these special risks of women. (Due to tuberculosis in Japan, male mortality almost outweighed that of females for a short span between age 20 and age 30, despite the fact that mortality for women was high.) It seems unlikely, however, on comparison with the pattern for India (Fig. 26). India was similarly an unhealthful place for men, but placed women at an even greater disadvantage.

[33] A trace of this same phenomenon can be found in the early life tables for Japan. These are based, of course, on a particular period and not on actual cohorts. In the 1947 table for all Japan, however, mortality of males was higher at every age.

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TABLE 38

TAIWANESE SURVIVORS THROUGH EARLY CHILDHOOD
(After Infancy)

Actual Survivors to Exact Age 10 of Each Thousand Males and Females Who Passed their First Birthday, by Year of First Birthday

Year	*Males*	*Females*	*Male Survivors per 100 Females*
1907	812	769	106
1908	822	781	105
1909	819	785	104
1910	825	792	104
1911	826	790	104
1912	820	784	105
1913	819	777	105
1914	813	777	105
1915	807	773	104
1916	812	780	104
1917	810	778	104
1918	814	787	103
1919	825	801	103
1920	843	822	102
1921	853	834	102
1922	865	846	102
1923	856	840	102
1924	852	834	102
1925	862	841	102
1926	863	846	102
1927	870	854	102
1928	870	854	102
1929	874	858	102
1930	870	855	102
1931	866	848	102
1932	873	861	101
1933	870	858	101
1934	870	858	101

Source: Based on Vital Statistics of each year.

In most of the world, more deaths occur in infancy than at any other year of age. This is especially true of Asia. Deaths before completing the first year of life used to eliminate close to one-fifth of all births in Taiwan. In many countries this figure is believed to be

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higher; cases of 25 per cent wastage of births in infancy have been known. Infant mortality is important for life tables also because it is difficult to measure. Most countries with high risks of death have been unable to keep adequate records of births, and infants who die after a few days or weeks in the world may not be accounted for either as births or deaths. The tests of completeness in registration and enumeration have demonstrated that in Taiwan nearly all children whose births were registered were also either enumerated in subsequent censuses or recorded as deaths if they did not survive.

The system of regulation that kept the local registers was severe as well as thorough. An entire community was held responsible, through its *pao-chia* organization, for failures to keep the registers in order. Some kinds of oversight might be successfully concealed, but if a child survived, its legal status as a person depended on having a record with the police, which was initiated by entering the event of birth. Pressure brought to bear by neighbors, if not prudence on the part of the family itself, tended to promote compliance with these rules. Consequently, a child could not easily remain alive very long and escape being entered in the official records.[34]

There remains, however, a problem of unregistered non-survivors, who might have died so young that no official cognizance was ever taken of their existence or decease. There are three kinds of evidence that some non-conformity of this sort existed early in the registration period. First, birth rates (Fig. 21) appear to have risen slightly, which though possible seems unlikely. Second, the rates of infant mortality that one can derive from unadjusted registration figures seem lower than they must have actually been, in view of the decline in mortality at other ages.[35] Finally, the sex ratio of registered live births was somewhat more masculine at the beginning than in later years. There is reason to suspect that some female infants might have been destroyed and not registered.[36]

[34] The government made provision for late registrations; there were very few, from which one can infer that almost all registrations that were made occurred soon after birth.

[35] All figures for infant mortality before 1916 that are shown here have been adjusted slightly, by a procedure that is described below. Unadjusted, the data make infant mortality appear to have *increased* over the first several years of record. One is led to believe that the opposite was true, in view of the fall of mortality at other ages.

[36] It is not easy to determine the extent or even the general existence of early infanticide in Taiwan. Missionaries and Western travellers often expressed indignation at the practice (see Pickering, Campbell, Davidson). Writings on both China and Taiwan have many references to it, mostly only gossip. Japanese officials took a strongly hostile attitude toward this disposal of infants, and apparently succeeded after a few years in

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165 This idiosyncrasy of the registration system did not prevent our tests from demonstrating almost perfect correspondence among registered births, deaths, and children counted in the census. In other words, the omissions were exactly the same for births as for deaths. Internal evidence indicates that they were not permitted to continue very long. Infant deaths were also tabulated for small intervals within a year, from which probabilities of survival by month can be estimated. The probabilities for the first month of life form a reasonably close regression on those for the second and third combined, for all years *except 1915 and earlier*. Between 1906 and 1915, the probabilities as recorded in the first month were higher than the values that the regression would imply. If we assume the regression of yearly observations after 1915 to be correct, and the probabilities in the second and third months of life to be accurate throughout, then the values for the first month reflect omissions before 1916 of babies who did not survive to one month of age. Following this assumption, all figures for births and infant deaths before 1916 that are used here have been adjusted upward slightly from their registered number to fit what regression values of these probabilities imply for infant mortality and births.[37]

Two procedures are often employed to measure infant mortality. The more appropriate one is to compile it as the proportion born who died in the first year of life, based on births occurring in a calendar year and the deaths to this cohort of births before their first birthday. This is the measure that corresponds to the concept of life-table mortality, and that will be used here except where otherwise specified. Ordinarily, however, deaths are not known by the year of birth of the decedents, but only by the calendar year of occurrence and by age. In this case it is customary to compute what we shall here call infant death rates, using simply the ratio of calendar-year births and calendar-year infant deaths.

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stamping it out. By 1906, when the vital statistics records can be relied upon in most matters, there was scarcely any trace of infanticide among Taiwanese.

To set limits on the extent of the practice, we may assume that all male births were registered, that infanticide occurred only to females, and that the true sex ratio of live births was 105. Then (the sex ratio of registered births in early years being 109), in the first five years not more than 2 per cent of female babies could have been disposed of in this way. In any case, the sex ratio of registered births soon fell to 105, and stayed between 105 and 106 thereafter.

[37] This is a conservative correction, since it entails the further assumption that these were the only omissions. The number of survivors to the end of the first year of life remains the same as before the adjustment.

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TABLE 39

INFANT MORTALITY OF TAIWANESE*

Deaths Per 1,000 Live Births in Each Year

	Males		*Females*	
Year	*Death Rate (Calendar-Year Deaths)*	*Mortality Rate (Actual Deaths)*	*Death Rate (Calendar-Year Deaths)*	*Mortality Rate (Actual Deaths)*
1906	192	182	173	165
1907	174	175	161	162
1908	190	188	173	172
1909	182	183	162	163
1910	167	168	144	144
1911	176	171	144	141
1912	164	169	139	143
1913	177	178	149	152
1914	180	187	161	167
1915	203	202	183	180
1916	193	179	161	150
1917	173	182	148	155
1918	202	199	172	173
1919	186	196	160	167
1920	190	178	161	149
1921	173	175	144	147
1922	184	180	155	150
1923	164	171	133	141
1924	190	196	159	164
1925	186	177	158	150
1926	171	—	139	—
1927	175	—	145	—
1928	181	—	152	—
1929	171	—	141	—
1930	163	—	139	—
1931	177	—	146	—
1932	167	—	140	—
1933	161	169	137	143
1934	167	163	143	139
1935	160	163	133	133
1936	159	159	131	133
1937	157	159	132	134
1938	159	155	132	128

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TABLE 39 (continued)

Year	Males		Females	
	Death Rate (Calendar-Year Deaths)	*Mortality Rate (Actual Deaths)*	*Death Rate (Calendar-Year Deaths)*	*Mortality Rate (Actual Deaths)*
1939	152	156	126	129
1940	148	136	122	114
1941	131	133	114	116
1942	136	—	116	—
1943	134	—	116	—

* Registered deaths have been adjusted slightly before 1916, based on a regression of mortality in the first month of life on mortality in the second and third months of life in 1916 and all subsequent years. Births have been adjusted accordingly. Data for actual mortality rates were not published for certain years.

Sources: Vital Statistics, individual years; *Statistical Summary*, Tables 64 and 89.

We must rely on death rates of this latter sort to examine the internal composition of infant mortality, for deaths by month-of-age were published only in this form. This approximation measures infant mortality with nearly the same yearly values as did the actual rates (see Table 39). It is worth while to tolerate some disagreement between the two in order to divide mortality of the first year into smaller intervals.

The progression of these death rates through time is plotted in Fig. 27. Infant mortality on the whole did not decline very sharply. (There will be occasion shortly to compare it with other ages.) If our guess about the defect in registration is correct, then two conclusions necessarily follow. First, the risks of death after the first month of age are documented fully, without omissions. Second, and more important, mortality in this span—the so-called postneonatal mortality—dropped no more than all infant mortality. Neonatal mortality then changed just as sharply as that of infants who survived the first month.[38]

Such a pattern of decline in infant deaths is contrary to what is commonly taken for granted. The usual suppositions about infant mortality in the process of decline have been made *a priori*, for

[38] In addition, according to our guess above, if additional events (births and deaths) ought to be added to the earliest years to make the figures absolutely complete, they must be added to the neonatal period, making mortality in the first month still higher at the beginning. This could only have the effect of indicating a more pronounced drop in neonatal mortality. There is almost no way of allocating extra deaths that could reverse the pattern shown in Fig. 27."

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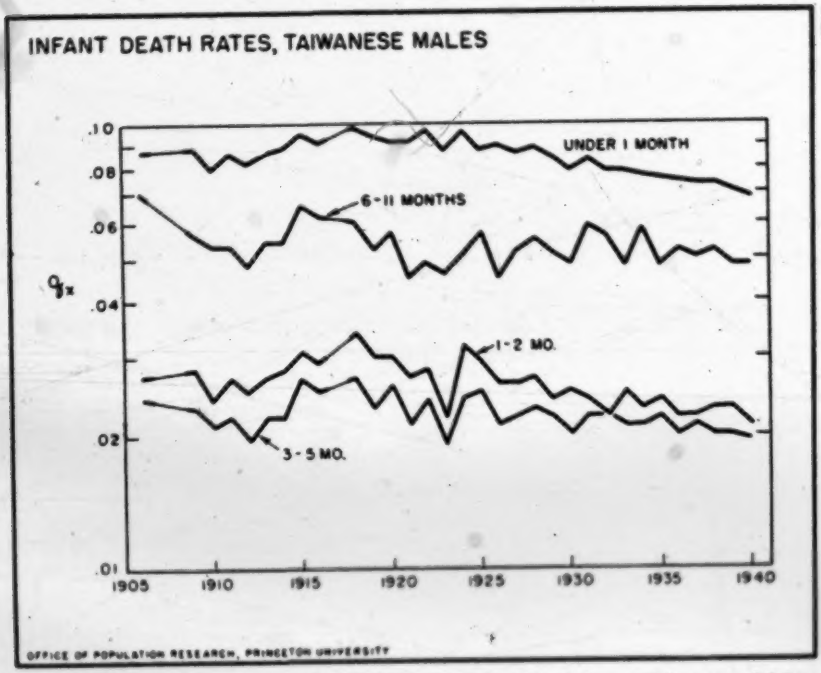

Fig. 27. Fall of Death Rates of Infants by Month of Age. Taiwanese Males, 1906-1940.

actual evidence is rare.[39] Neonatal mortality is thought to be resistant to measures that bring infant mortality under control and thus to most general health measures. Part of the reason may lie in particular environmental influences such as standards of nutrition in a population, the climatic conditions, and the customs governing childbirth and infant care. Part also may be linked with maternal health, which could exert a pre-natal as well as post-natal effect on the chances of live-born babies to survive. It is curious that the distinctive behavior of neonatal mortality in Taiwan (as compared with Europe and America) should coincide with the distinctive low mortality of adult women in childbearing ages. Whether or not one has influenced the other is impossible to say without actual information on the matter. The medical aspects of reproduction in such an Asian

[39] The evidence also has come from European and American countries. Unfortunately it has been subject to a large sampling bias, inasmuch as it represents those countries whose progress toward low mortality has occurred within a particular cultural order, of which the individual countries are but variants.

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• 165 cultural order are so little known in the West that the question cannot be pursued further except by speculation.

Decline of Mortality by Age

The appearance that the data above give to infant mortality may lead us to keep certain reservations about their accuracy. No such doubt can exist about the general validity of mortality registered at age one and above. The tests reported in Table 34 and Table 35 present Taiwan's statistical system as a paragon even among those of the technologically advanced nations in the world. The trends they show in mortality of later life cannot but be accepted.

For what they are worth, our best estimates of mortality in infancy suggest that it did not decline sharply. On surer ground, it is certain that the chances of dying in later years of childhood and early adulthood fell faster. Fig. 28 displays graphically the basic data on rate of decline in mortality (chances of dying) at selected ages of males entering those ages each year.[40] In the ages taken here as examples—1, 2, 3, 4, 10 and 25—older children and young adults gained the most in chances of survival. Among children, in general the older, the more the improvement. Every higher age gained more ground than infants. Part of this difference may be due to the nature of changes made through colonial administration in the external risks confronting persons of each age. But doubtless a certain part is also due to the effect of carrying improved health from one age to the next by the same individuals—the "cohort effect." Yearly fluctuations are large enough, however, that no special patterns of either type are to be found without complicated manipulations of the data.

To find the risks declining more or less together at different ages does not imply that the number of years of life saved in the population was the same with advancing age. The saving of life in infancy was greater, despite the more moderate drop in the risks than at any other age. This fact holds true regardless of whether one adopts this period-by-period approach or follows the mortality of successive actual cohorts.

[40] The earlier values of the mortality rates at higher ages are connected with broken lines because the observations are not spaced at every year. Mortality rates for every year have been computed only for persons born after 1905.

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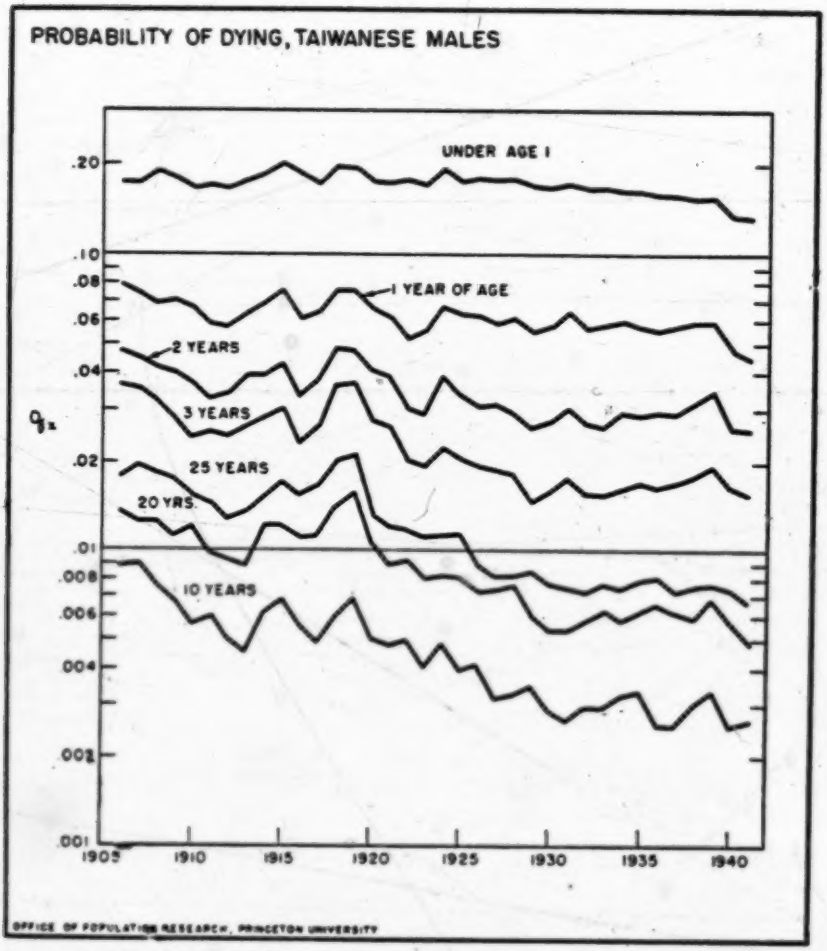

Fig. 28. Decline of Mortality by Age, 1906-1941. Taiwanese Males.

Sectional Differences in Mortality

It would be strange if for people of each age the risks of death were the same everywhere in Taiwan. It happens that most of our information can be obtained only for the island taken as a whole. The measures have been designed to take advantage of this and to present a detailed view of the total population at some sacrifice of knowledge about its parts. Moreover, with a total population that

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•165 was so small, any reduction in the number of cases tends to make sensitive measurements unreliable.

The livelihood of Taiwanese farmers brought them into close and continual contact with their physical surroundings. Such a people cannot avoid some influence of climate and environment on its chances of survival. For a place so small there were marked differences in seasons and rainfall over the island. Whether or not related to this factor, from time to time local peculiarities in the incidence of disease have often been noted.

In pre-Japanese times, isolation of small localities kept much of the communicable disease from being transmitted across the island. Even epidemics were observed that stayed confined to towns and apparently did not become general. The Japanese destroyed this barrier by an efficient network of communications, but maintained special medical inspections on the railroads and at check points on routes of heavy travel. They also imposed port restrictions to prevent disease from being imported from abroad.

As the site of the most modern cities and the favorite residence of Japanese, Taipei Prefecture was one of the safest places in which to live. It was also more liberally supplied with medical facilities than any other Prefecture, because it was Taiwan's center for training and research in tropical medicine. It was relatively free from malaria, and contained the most elaborate sanitary facilities in the island. Other sections were less distinguished, unless by exceptionally heavy incidence of sickness. Taichung was the most afflicted with malaria. The three southern Prefectures were all said to have an unusual amount of influenza and other respiratory disease. The smaller settlements along the eastern coast started out with health conditions far inferior to the rest, though they were gradually improved.

Whatever the causes, there were wide disparities in age-specific mortality among the various Prefectures as late as 1925 (see Fig. 29, for males only). For some unknown reason Hsinchu was the most favored part of the island, followed by Taipei. The range from highest to lowest at this date was almost as great as between the beginning and the end of the Japanese period. It is interesting also that the differences were consistent at all ages, with almost no shifts in the standing of Prefectures at any age. At a time when there was very little migration between Prefectures, these life table values may be regarded as a good representation of actual differences.

Expressed as the mean expectation of life at selected ages (Table

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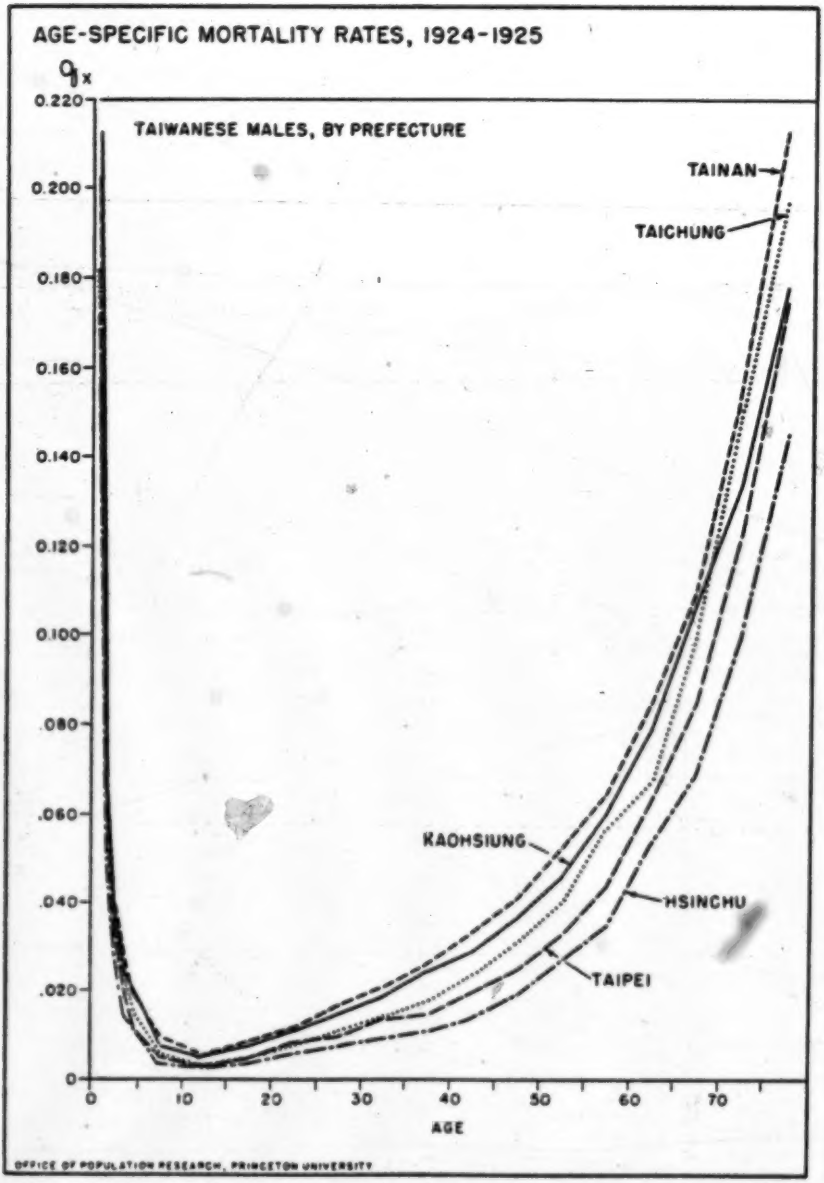

Fig. 29. Mortality of Taiwanese Males in Each Age, by Prefecture. Values of q_x, Life Tables of 1924-1925.

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TABLE 40

MEAN LIFE EXPECTANCY OF TAIWANESE AT DIFFERENT AGES

Prefectural Life Tables of 1924-1925. Values of e_x, in Years

Age	PREFECTURE				
	Taipei	*Hsinchu*	*Taichung*	*Tainan*	*Kaohsiung*
			Males		
0	38.3	43.1	35.9	30.4	31.7
1	45.2	50.2	42.8	37.1	39.2
5	47.5	51.5	45.7	39.7	41.8
10	43.6	47.4	42.0	36.5	38.3
30	28.0	31.1	26.0	22.3	23.8
50	15.4	17.1	13.9	12.4	13.2
			Females		
0	42.2	46.6	40.7	34.7	34.5
1	48.3	52.3	46.9	40.8	41.4
5	52.8	55.1	52.0	45.0	45.8
10	49.2	51.4	48.5	41.9	42.7
30	33.7	35.4	32.6	28.3	28.8
50	20.1	20.4	19.1	17.0	17.2

Sources: Computed from census and vital registration data of 1924 and 1925.

40), the effects of mortality were as heavy in Tainan as for the total island in 1909-1911. On the other hand, the expectancy was even higher at all ages in Hsinchu than for all of Taiwan in 1936-1940, and much higher in the ages of childhood (cf. Table 37, above). Mortality according to these data tended to align itself with the axis of the island—low in the north, high in the south, and intermediate in the central part. For a land so small, and a population of so few, sectional differences of this magnitude are indeed surprising. (The two small eastern Prefectures have been omitted, not having enough people to make a meaningful life table.)

This pattern of dissimilarity was of long standing. Turning to cruder indices, we can see that the same order of ranking existed throughout the registration period (see Table 41). No matter what index of mortality is used, the grouping remains almost unchanged.

Here also it is evident that the places of higher mortality were making the faster progress toward control over death than the ones that were already low. This appears as well in the fact that the rela-

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TABLE 41

TAIWAN. DIFFERENCES IN MORTALITY BY PREFECTURE, IN SELECTED YEARS

Crude Death Rates, Infant Death Rates, and Deaths Per Thousand Females Aged 15 to 49†

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	PREFECTURES*							
Year	*Taipei*	*Hsinchu*	*Taichung*	*Tainan*	*Kaohsiung*	*Taitung & Hualien*	*P'enghu Islands*	*Total Island*
				Crude Death Rates				
1906	28	22	37	42	41	35	37	35
1915	25	20	30	36	34	30	26	29
1925	23	19	24	29	29	31	26	25
1930	22	17	21	23	24	21	22	21
1935	22	19	21	21	21	21	19	21
				Infant Death Rates				
1906	—	—	—	—	—	—	—	192
1915	162	138	176	192	191	148	204	174
1925	157	139	164	180	191	149	—‡	167
1930	157	130	153	161	179	152	172	156
1935	154	139	146	151	155	160	131	149
				Deaths per Thousand Women Aged 15-49				
1906	13	10	15	29	26	24	15	20
1915	11	9	13	20	20	16	12	15
1925	9	7	9	14	14	15	—‡	11
1930	8	6	7	9	10	8	9	8
1935	8	7	8	8	9	9	5	8

† All rates are averaged over three years around the census year. Those for 1906 represent one year only. Infant death rates have been omitted for 1906, as being unreliable.

* Prefectural divisions before 1920 have been matched approximately to the subsequent boundaries.

‡ Included in Kaohsiung Prefecture.

tive dispersion of death rates was continually being reduced along with the death rates themselves.

As expressed in terms of the *relative* variation among Prefectures in Table 42, the gains in survival were being spread more evenly over the various portions of the island as time went on. And part of the reduction in mortality for the total must have taken the form merely of levelling some of the initial inequities in health

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TABLE 42

RELATIVE VARIATION OF MORTALITY AMONG PREFECTURES IN SELECTED YEARS

Coefficients of Variation for the Death Rates of Each Year in Table 41

Year	*Crude Death Rates*	*Infant Death Rates*	*Deaths/ Women 15-49*
1906	19.2	—	36.0
1915	17.7	13.2	27.9
1925	15.2	10.8	27.3
1930	9.6	9.3	15.2
1935	5.1	6.3	16.6

Source: Computed from data of Table 41.

conditions. Much headway was made in this process after 1925, when the life tables above revealed such large gaps in the degree of control over sickness and death. It must be kept in mind when studying mortality here and in other areas of rapid decline that initial achievement is likely not to extend to many in the population, and that later progress may be no more than bringing more types of people nearer to the same point as the ones who were privileged in the beginning.

Taiwan formerly had a well-earned reputation as a spot of capricious and unchecked risks to life among its inhabitants. Its position athwart trading routes of the last century made it a likely place to introduce epidemic disease from the rest of Asia. As it became drawn into contact with the outside world and its wider sources of infection, the state of medical knowledge among its people did not keep pace. The former government lacked the capacity and the incentive to adopt measures that might alleviate or forestall such sickness. Taiwanese were therefore often subjected to intense attacks of these diseases, some of them becoming general over the island.

In fifty years of administration the Japanese quickly eliminated epidemics. They succeeded in gradually making the other sources of fatal illness and ill health less prevalent, and thus postponed the prospect of death for Taiwanese. While some characteristics of the decline in mortality that they induced followed familiar patterns, it also carried certain distinctive traits of the society in which it occurred. Special features like the apparent vitality of adult women

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and the importance of neonatal mortality in the decline of total infant mortality we have established with repeated observations. As far as present knowledge is equipped to deal with them, these peculiarities must remain inexplicable.

The means to this accomplishment were inexpensive and rudimentary. Aside from probably raising levels of living, the Japanese developed a concerted program against an important group of dangers to health. They attacked those pestilent conditions that can be reached through sanitation and slight reorganizations on a mass scale of practices that were deeply rooted in custom. More thorough measures, which were also more burdensome, were avoided. Their health program relied on administrative efficiency and energy in execution to make up for what it lacked in elegance of equipment and technique.

It is significant to find that such an approach could achieve the results that it did. In many other areas of high mortality the desire to reduce the risks of death is prompting steps in the same direction, and Taiwan's experience ought to prove instructive for such efforts. It is only a modest sample of what might be done in a "backward" region with effective administration—without necessarily incurring the great expense often thought to be associated with high standards of public health. Recent progress in research and development of drugs can make success more certain than before. Future strides in medical knowledge can enhance it still further.

The greatest limitation is that health promotion among people with high mortality requires constant vigilance. Default threatens such a program with collapse, for medical procedures now known are still not automatic, nor are they foolproof. Japanese measures to control disease were primarily suppressive. They did not eradicate malaria or remove the potential sources of cholera infection. Failure to appreciate these latent dangers led to severe outbreaks of cholera and malaria after the island was taken over by forces from the mainland in 1945. Since then the standards of administration, which had been allowed to deteriorate, have been raised again; with the improved technical knowledge at its disposal, the Nationalist government may be able to keep mortality at levels even below those of the Japanese period. The example of Japanese health policies, however, remains a useful lesson in what energetic measures can accomplish without the benefit of these superior medical facilities.

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CHAPTER VI. APPENDIX

TAIWANESE LIFE TABLES

Number of Survivors to 10,000 Live Births (l_x), Selected Years, by Year in Which Persons Entered Each Age

	1906		1909-1911		1915		1919		1921		1926-1930		1936-1940		
Age	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Age
0	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	0
1	8,078	8,270	8,261	8,510	7,980	8,200	8,037	8,328	8,080	8,377	8,257	8,546	8,444	8,706	1
2	7,458	7,552	7,728	7,892	7,363	7,472	7,422	7,611	7,590	7,811	7,775	8,004	7,959	8,169	2
3	7,100	7,061	7,446	7,491	7,045	7,033	7,061	7,158	7,290	7,450	7,551	7,705	7,713	7,876	3
4	6,841	6,721	7,253	7,232	6,829	6,750	6,802	6,838	7,097	7,209	7,420	7,541	7,578	7,717	4
5	6,668	6,498	7,125	7,072	6,683	6,562	6,613	6,607	6,974	7,062	7,337	7,445	7,495	7,627	5
10	6,189	5,945	6,811	6,717	6,337	6,159	6,217	6,121	6,694	6,745	7,154	7,258	7,319	7,453	10
15	5,949	5,680	6,624	6,543	6,139	5,980	6,009	5,876	6,554	6,612	7,038	7,150	7,216	7,354	15
20	5,646	5,353	6,379	6,273	5,872	5,704	5,691	5,528	6,329	6,419	6,860	6,975	7,048	7,199	20
25	5,222	4,948	5,986	5,886	5,477	5,344	5,212	5,043	6,020	6,122	6,592	6,724	6,809	6,988	25
30	4,707	4,514	5,491	5,486	4,954	4,938	4,617	4,524	5,634	5,816	6,268	6,440	6,530	6,754	30
35	4,123	4,061	4,924	5,058	4,355	4,511	4,015	4,014	5,194	5,446	5,884	6,114	6,201	6,479	35
40	3,479	3,615	4,301	4,605	3,725	4,061	3,398	3,550	4,705	5,074	5,423	5,749	5,820	6,156	40
45	2,841	3,193	3,625	4,183	3,063	3,620	2,805	3,140	4,154	4,696	4,892	5,377	5,234	5,816	45
50	2,217	2,753	2,944	3,739	2,413	3,201	2,236	2,744	3,590	4,305	4,290	4,986	4,766	5,443	50
55	1,642	2,285	2,278	3,227	1,812	2,696	1,712	2,324	2,957	3,884	3,637	4,534	4,101	4,990	55
60	1,153	1,819	1,658	2,674	1,260	2,150	1,224	1,884	2,311	3,366	2,938	3,988	3,347	4,424	60
65	735	1,344	1,139	2,092	812	1,586	798	1,434	1,689	2,766	2,192	3,315	2,546	3,734	65
70	414	892	697	1,498	456	1,056	443	996	1,087	2,107	1,472	2,553	1,738	2,926	70
75	191	502	368	931	212	573	217	595	616	1,413	845	1,750	1,010	2,005	75
80	73	232	137	477	80	244	80	281	288	745	387	1,007	465	1,126	80
85	24	103	45	212	26	108	26	125	95	330	128	446	153	461	85
90	5	31	9	64	5	32	5	38	19	99	26	134	30	114	90

Sources: Life tables of 1906, 1909-11, 1915, 1919 and 1921 were computed from the assembled data of Taiwan's censuses and vital registration. The table of 1926-30 is from Taiwan, Government-General (1936); that of 1936-40 is from Taiwan, Provincial Government (1947).